AUTOMOTIVE INDUSTRIES

A CHILTON PUBLICATION

FEBRUARY 1, 1959

Features • • •

Machining Pistons for Detroit Diesel Engines

Highlights of SAE Annual Meeting in Detroit

Automatic Machining of Armasteel Crankshafts

Details of the Ford Limited-Slip Differential

Driverless Tractor Has Automatic Controls

Automated Line for Making Paint Test Panels

COMPLETE TABLE OF CONTENTS, PAGE 3

Automotive and Aviation Manufacturing

ENGINEERING • PRODUCTION • MANAGEMENT

How RYKON GREASE

has performed in six tough applications

In just two years since introduction, **RYKON** Grease has stepped in to deliver lubrication in hundreds of applications where other greases have failed

The reason RYKON Grease can perform under conditions that cause other greases to fail is this: RYKON Grease has a unique non-soap, organic thickener. This thickener holds the oil between its fibers better than any other gelling agent. The thickener is able to withstand extremely high as well as low temperatures. It resists chemical action and remains stable under conditions of severe working and water washing. RYKON Grease has exceptional anti-rust properties.

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More facts about RYKON Grease are yours for the asking. Call the lubrication specialist in your nearby Standard Oil office in any of the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 S. Michigan Ave., Chicago 80, Illinois.**

1

2

3

4

In the metalworking industry, where higher speeds, loads, temperatures and pressures are being put on bearings as a means of increasing productivity of equipment, a new type of grease has been needed. RYKON is that grease. Here are just 6 examples of how RYKON Grease has performed in tough spots.

Industry	Equipment	Type of Bearings	Conditions	Remarks
Metalworking	bearings over molten pot	—	high temperature	Temperature reaches 500° F. at times. RYKON stays in longer.
Steel Mill	pit crane, floor crane, charging car	plain and anti-friction	high temperature	Lasts twice as long as some other greases used.
Metalworking	drill head multi-spindle	anti-friction	heavy load	Other greases failed. Running cool on RYKON. No leakage.
Auto Manufacturer	switches on machine tools	—	wet	Good water protection and dielectric strength at a lower cost than previously.
Die Caster	die cast machines	various	high temperature	Cut down wear considerably.
Bearing Manufacturer	high speed spindle bearings	anti-friction	high temperature, heavy load	Lasts twice as long as a high priced bearing grease. Does not darken or form varnish.

You expect more from **STANDARD** *and you get it!*

Oven test shows high temperature performance of RYKON Grease. 1. Metal panel coated with RYKON and placed in oven at 350° F. 2. Same panel after five days. RYKON is still soft and ready to lubricate. 3. Another high-melt grease ready for same test. 4. Same panel after oven test. Grease has failed completely.

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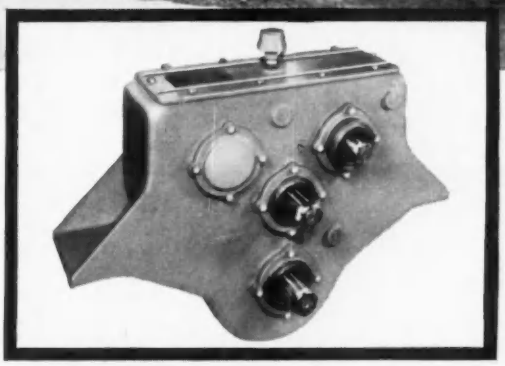
Powering the "big gun" in a battle for lives



To transfer power and provide dual P.T.O.'s to meet the specialized requirements of traction and pump drives on large crash trucks, Ward LaFrance Corporation, Elmira Heights, New York, relies on Cotta Model TR-953 Heavy-Duty Transmission.

through dependable heavy-duty

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"Engineered-to-order"

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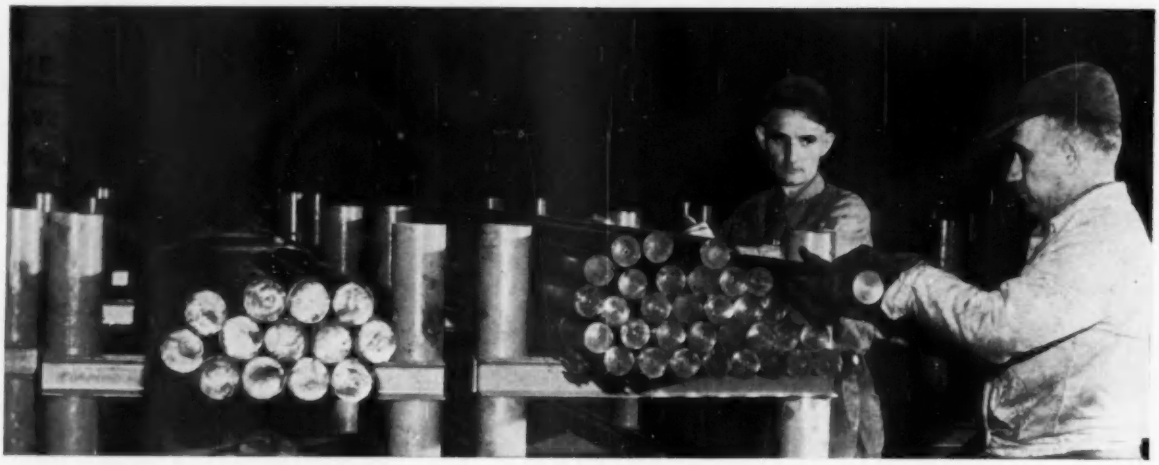
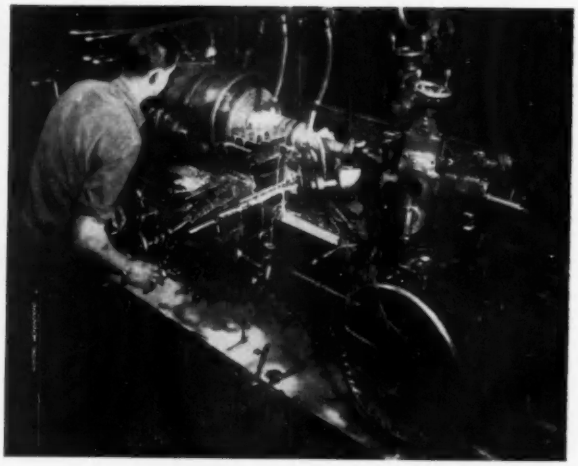


simplify materials control... standardize manufacturing processes



by standardizing on two alloy steels... 4340 and 4620

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AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE · PUBLISHED SEMI-MONTHLY

FEBRUARY 1, 1959 VOL. 120 No. 3

Features • • •

Machining Pistons for Diesel Engines

Highlights of a piston machining line and an engine assembly line at Detroit Diesel Engine Div.'s new plant are given here. Page 24.

Buick's Fully Mechanized Foundry

Buick has installed a highly mechanized molding line to produce castings used in the engine assembly. Page 29.

SAE Annual Meeting

Latest automotive developments—new materials, power steering, brakes, engines, radioisotope uses, and new vehicles—held the center of the stage at the recent SAE annual meeting. Page 30.

Crankshafts Machined on Automatic Lathes

A battery of four Wickes automatic lathes machines the four crankpins of the Armasteel cast crankshaft used in 1959 Pontiac engines. Page 36.

Ford Limited-Slip Differential

A so-called limited-slip differential by Ford works through a single, constantly preloaded clutch set to slip at torques of 315 to 385 lb/ft. Page 37.

Leduc Power Steering Unit

Turner Mfg. Co. of Britain is now producing a servo-steering unit (for commercial vehicles) based on the Leduc aircraft control. Main components are a cylinder, a differential servo piston, and a coaxial control piston. Page 38.

British Driverless Tractor

A farm tractor that drives itself and even obeys normal traffic signals has been developed at England's University of Reading. Page 39.

Automated Line for Paint Test Panels

A high-speed automated production line for paint test panels is now in operation at Parker Rust Proof Co. Page 40.

Metals

Steel capacity is now 147.6 million tons a year compared with 140.7 million tons in 1958, a five per cent gain. Based on the new capacity, operations now are about 74.5 per cent, and are expected to be moderately higher than in the last quarter of 1958, says AI metals analyst in his monthly report. Page 42.

CONTINUED NEXT PAGE

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AUTOMOTIVE INDUSTRIES

Features • • • continued

▼ **Tape-Controlled Lathe**

Costs for short-run jobs are cut by a vertical turret lathe that takes its orders from a tape-control system developed by Giddings & Lewis Machine Tool Co. Page 45.

▼ **31 New Product Items And Other Features, Such As:**

Observations, farm equipment industry report, automation news report, news of machinery industries, and industry statistics.

News Previews • • •

AMC Earnings Top $21 Million..... 17
Ford Div. Doubling Work Force at Lorain, Ohio.. 17
Cadillac Introduces $13,000 Eldorado Brougham.. 17
Mack Trucks Introduces "New Look" Transit Bus 18
Renault Predicts U.S. Sales of 100,000 Cars..... 18
Chrysler Is Shut By New Strike..... 18
New Devices Cut Car Exhaust By 90 Per Cent.... 19
Big Three Small Car Will Expand Market..... 19
Army Announces Plastic Wheels..... 20
Senate Committee To Probe Car Financing..... 20
De Soto Studies Fuel Cell As Power For Car.... 20
Manned Space Capsule To Cost Over $15 Million 22
Bendix Aviation Reports Drop In Sales, Earnings 22
Convair Gets Navy Contract for Terrier Missile 46
Beechcraft Super 18 To Have Standby Rocket.... 46

Departments • • •

Calendar of Coming Events..... 6
News of The Automotive and Aviation Industries 17
Men in the News..... 23
Observations. *By Joseph Geschelin*..... 41
Metals. *By William Boericke* 42
Farm Equipment Report. *By Kenneth Rose*..... 43
Industry Statistics 44
Automation News Report. *By Samuel Cummings*.. 45
Machinery News. *By Charles A. Weinert*..... 48
New Plant and Production Equipment..... 52
New Automotive and Aviation Products..... 60
Shorties 69
On Our Washington Wire..... 70
Free Literature .....At Back of This Issue
Advertiser's Index 82

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PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY • PARTS & COMPONENTS • ACCESSORIES • PRODUCTION, SERVICE and MAINTENANCE EQUIPMENT • ENGINEERING • PRODUCTION • MANAGEMENT

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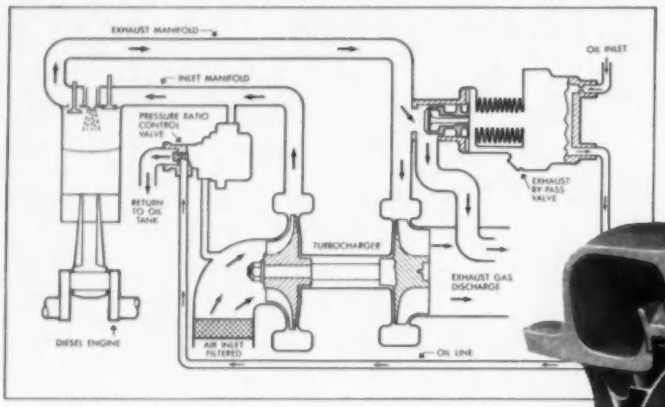
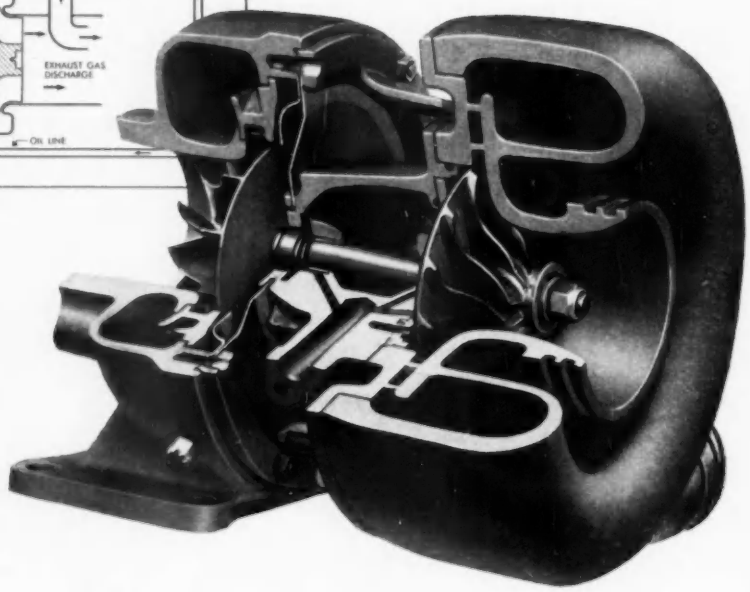


Pressure ratio control valve

Exhaust by-pass valve



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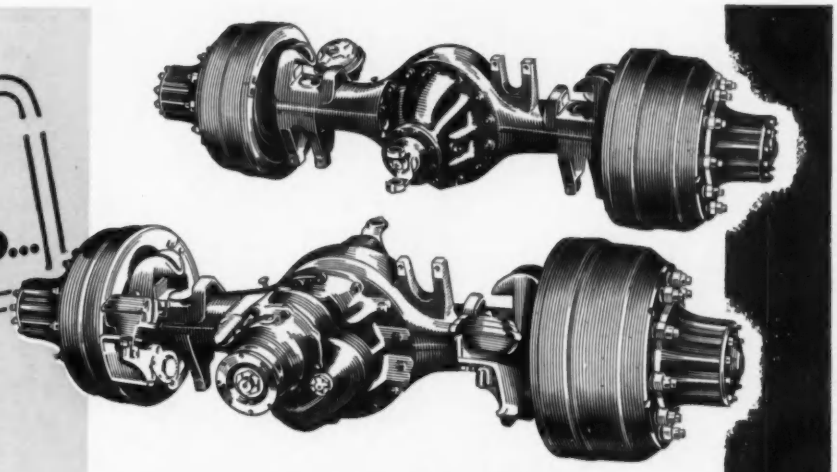

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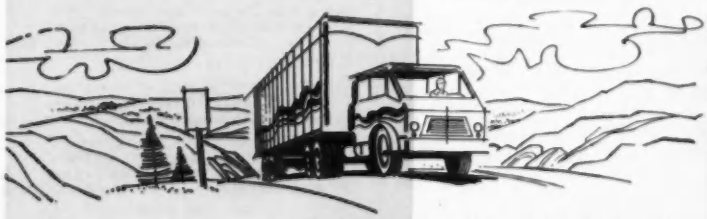

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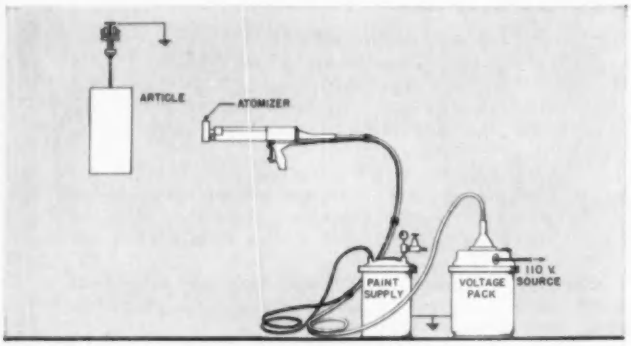

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American Society for Testing Materials, Committee D-2 meeting, Sheraton-Jefferson Hotel, St. Louis, Mo. .....Feb. 1-6

Automotive Accessories Manufacturers of America, 32nd annual exposition, New York Coliseum, New York, N. Y. .....Feb. 2-5

14th Reinforced Plastic Division Conference, sponsored by Society of Plastics Industry, Inc., Edgewater Beach Hotel, Chicago, Ill. .....Feb. 3-5

Industrial Management Engineering Conference, Illinois Institute of Technology, Metallurgical and Chemical Engineering Bldg., 10 W. 33rd St., Chicago, Ill.....Feb. 5-6

Amsterdam Automobile Show, Amsterdam, Holland .....Feb. 5-14

Computer and Data Processing Conference, Dept. of Industrial Engineering, Purdue University, Purdue, Ind. .....Feb. 12-13

International Automotive Service Industries Show, Navy Pier, Chicago, Ill. .....Feb. 18-21

American Petroleum Institute Div. of Marketing, Lubrication Committee Meeting, Sheraton-Cadillac Hotel, Detroit, Mich. ..Feb. 26-27

World Wide Auto Show, Miami Beach Exhibition Hall, Miami Beach, Fla. .....Feb. 27-Mar. 8

Leipzig Spring Fair, Leipzig, E. Germany .....Mar. 1-10

Ninth Annual National Autorama, Connecticut State Armory, Hartford, Conn. .....Mar. 4-8

Institute of Aeronautical Sciences, Flight Propulsion Meeting (classified), Hotel Carter, Cleveland, O. .....Mar. 5-6

Western Space Age Conference and Exhibit, Great Western Exhibit Center, Los Angeles, Calif...Mar. 5-7

ASME Gas Turbine Conference and Exposition, Netherland Hilton Hotel, Cincinnati, O. .....Mar. 8-11

Steel Founders' Society of America, 58th annual meeting, Drake Hotel, Chicago, Ill. .....Mar. 9-10

ASME Aviation Division Conference, Statler-Hilton Hotel, Los Angeles, Calif. .....Mar. 9-12

National Association of Manufacturers Institute on Industrial Relations, Hollywood Beach Hotel, Hollywood, Fla. .....Mar. 9-13

Ninth Annual Iron & Steel Conference, sponsored by Pittsburgh Section of Instrument Society of America, Pick-Roosevelt Hotel, Pittsburgh, Pa. .....Mar. 11-12

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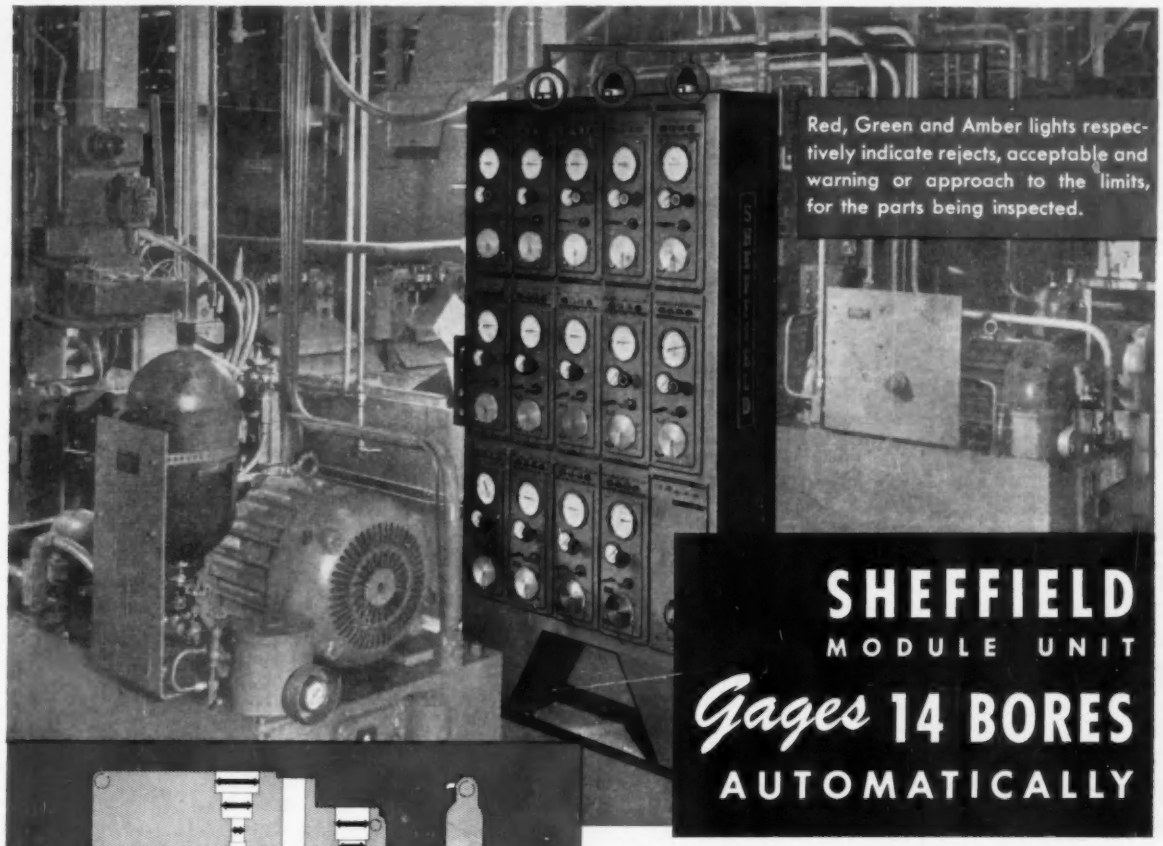
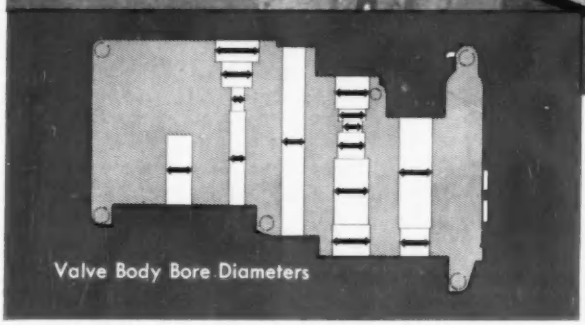


Red, Green and Amber lights respectively indicate rejects, acceptable and warning or approach to the limits, for the parts being inspected.

SHEFFIELD MODULE UNIT *Gages* 14 BORES AUTOMATICALLY



Valve Body Bore Diameters

Transmission valve bodies directly from the boring machines are conveyed to gaging position. Air gaging spindles enter simultaneously to explore the dimensional fitness of each bore and to detect any possible obstruction such as a broken tool fragment.

The results of the pneumatic check are transformed into visual signals and electrical impulses—the latter for use in the automatic control of the boring machines.

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Each Modulaire is a self-contained unit which may be slipped out of the assembly and replaced without interfering with other units of the assembly.

Each group of Modules is provided with a Sheffield Monitorecord Circuit for quickly checking the time cycles of the gaging functions. This is an integral part of every Sheffield Automatic Control System.

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Sheffield air gage spindles are designed with greater hole clearance to minimize wear. They float for slight differences in bore location and thus further extend service life.

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The sensing units of Sheffield automatic gages may also be electronic, electrical or mechanical as well as pneumatic. The choice depends on individual requirements or restrictions. Sheffield builds gages of all types as well as data handling systems.

8194

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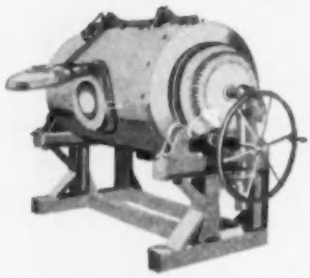
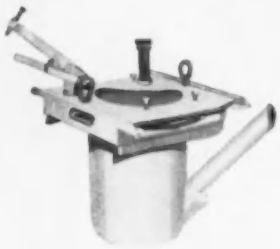
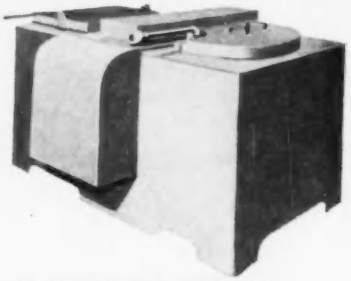


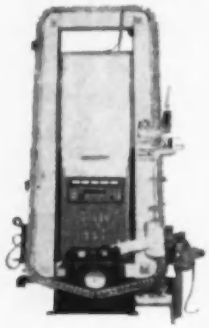
Rotary Open-Flame Smelting Furnaces: Lindberg-Fisher Simplex (shown) either oil or gas fired with capacities to 30,000 lbs. brass, 2,400 lbs. aluminum.



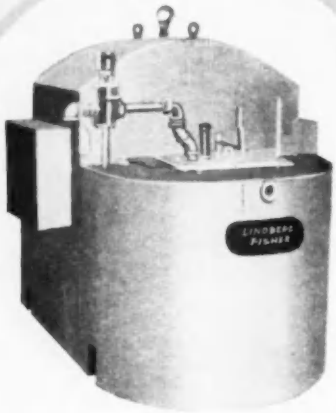
Automatic Ladling Units: The Autoladle "Little Joe". The first practical automatic aluminum ladling unit yet devised.



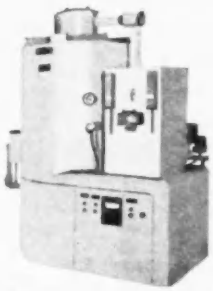
Induction Melting and Holding Furnaces: Lindberg-Fisher two-chamber furnace (shown) melts in one chamber, holds at correct temperature in other.



High Frequency Units: Vertically designed, completely automatic "HF" unit (Shown) for aluminizing automotive valves.

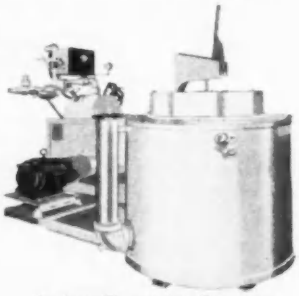


Melting and Holding Furnaces: Electric resistance furnace (shown) with capacities of 750 lbs. to 1500 lbs.

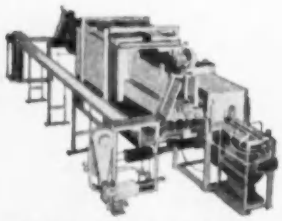


Atmosphere Generators: Hyen generator (shown) for endothermic atmospheres. Generators for all required atmospheres.

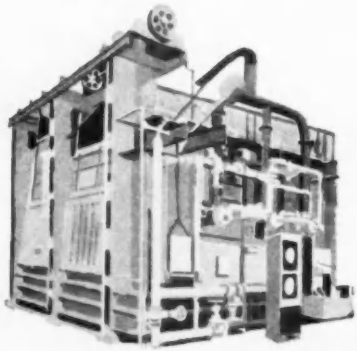
Pilot Plant Equipment: Atmosphere tube unit (shown) for ceramic research and development at temperatures up to 2750° F.



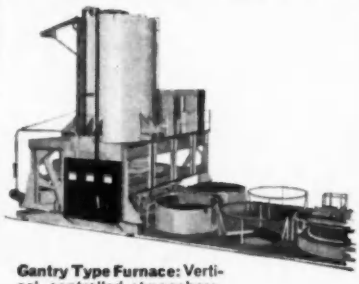
Cyclone Tempering Furnaces: Batch type fuel-fired tempering furnace (shown). Famous in metal treating industry for years.



Ceramic Kilns: Fully automatic, atmosphere controlled kiln (shown) has 5 control zones for flexibility. Maximum temperature, 2700° F.



Aluminum Reverberatory Furnaces: Twin-chamber melting and holding furnace (shown) with 45,000 lbs. capacity.



Gantry Type Furnace: Vertical, controlled-atmosphere, drop bottom, hardening furnace. Complete installation field-installed by Lindberg.

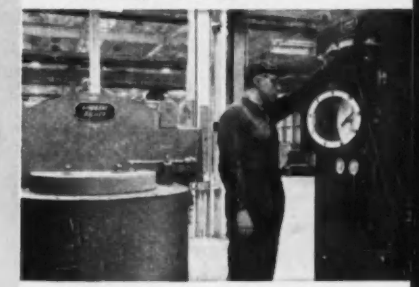
Lindberg-Designed

furnaces, more than 75 of them, help Ford Motor Company maintain casting production and quality standards

The new Aluminum Castings Plant of Ford Motor Company, Engine and Foundry Division, at Sheffield, Alabama, is a model of modern production efficiency. Contributing to its effective operation is a huge battery of Lindberg-Fisher aluminum holding furnaces, more than 75 of them. Eight large 65,000 lb. capacity reverberatory holding furnaces receive molten aluminum delivered from an adjacent Reynolds Metals plant and hold it at the desired temperature. Six other reverberatory furnaces, each with 20,000 lb. capacity, are used for remelting scrap aluminum from trimmed parts and holding metal at its usable temperatures. Molten metal is then delivered to more than 60 electric resistance holding furnaces in the casting area as needed. This unique installation, developed by Ford engineers in conjunction with Lindberg, is a major factor in maintaining the high quality product and production standards required by Ford.

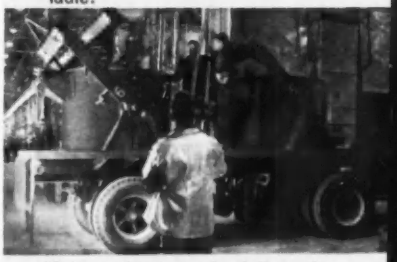
Lindberg equipment and Lindberg planning can help you find the most effective answer to any problem of applying heat to industry. We cover the field, melting and holding, heat treating, tempering, brazing, enameling furnaces, ceramic kilns, high frequency units, and are in the ideal position to recommend just the type of equipment most suitable for your needs. This can be factory built or field-installed in your own plant, fuel-fired or electric. Consult your local Lindberg Field Representative (see the classified phone book) or get in touch with us direct. Lindberg-Fisher Division, Lindberg Engineering Company, 2491 West Hubbard Street, Chicago 12, Illinois. Los Angeles Plant: 11937 South Regentview Avenue, at Downey, California.

Handsome entrance to new plant of Ford Motor Company, Sheffield, Alabama.

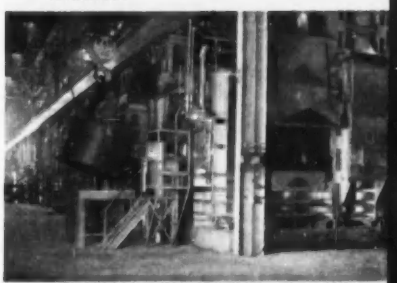


Metal temperatures are positively controlled through Lindberg Control Panel.

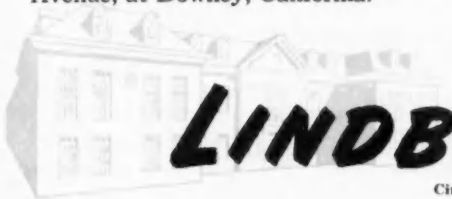
Some furnaces are arranged for hand ladling and others are equipped with Lindberg Autoladle.



Molten aluminum is delivered direct to reverberatory holding furnaces.



The molten metal is held in these 14 huge furnaces for distribution to the casting areas.



LINDBERG heat for industry

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the spirit of 76...

THE SPIRIT OF '76 . . . exemplifying strength —dependability—determination to move forward through the years.

Wyman-Gordon enters its 76th year still forging ahead with new forging techniques—still meeting the challenge of the seemingly impossible in this age of power and speed on the ground—in the air—and in outer space.

It is a far cry from the modest beginning in 1883 to the forging industry's most modern testing and research facilities in the extensive laboratories of Wyman-Gordon today—assurance of the ultimate in forging quality.

From the high wheel bicycle through the "horseless carriage" days to the "Mach era" of aircraft and space vehicles, Wyman-Gordon has marched under the standard of "The Greatest Name in Forging."

WYMAN-GORDON COMPANY

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Circle 113 on Inquiry Card, for more Data →

BIGGEST TURN SIGNAL NEWS IN YEARS!

K-D's New trouble-free

PUSH BUTTON SWITCH*

For Turn Signals and 4-Way Flashing

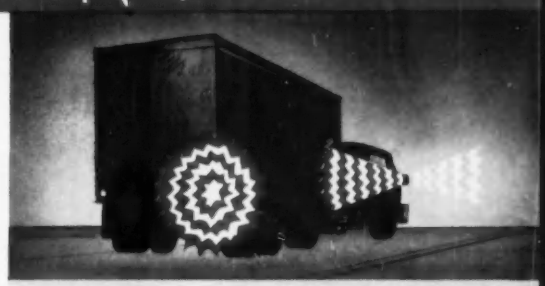
Here's the new flare type turn signal control you've been waiting for. It's as simple and wear-proof as your electric light switch. Push "L" button and left lights are on. Push "R" button and right lights are on. Push both buttons and all four signals flash roadside distress. Push top "C" button to cancel.

That's the simple story of the most revolutionary development in turn signal control for truck operation safety ever . . . and as you'd expect . . . it's by K-D Lamp Company's pioneering engineers.

LIFETIME GUARANTY KD 723 Push Button Switch has *only a few working parts!* There's nothing that will wear out. So, you get a lifetime guaranty against trouble.

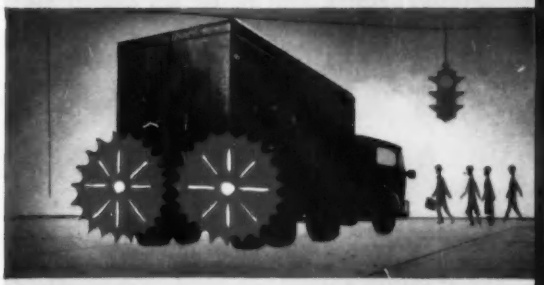
EQUIP FOR SAFETY Before an accident to your truck delays your delivery schedule, get one of these positive-action *Push Button Switches* to take care of each unit . . . truck, tractor, panel truck, pickup truck, even cars. Ask your jobber salesman tomorrow about KD 723 Push Button Switch or Complete Set of Switch and Signal Lites.

*Patent Applied For



TURN SIGNAL Push one button . . . both front and rear signals flash light patterns. Fast sure warning that vehicle is turning or passing.

DISTRESS Until the driver can spot warning flares, he simply pushes *both* buttons and *all four signals flash* a warning that his unit is stalled and in trouble!



STOP AND REAR LITES The lamps in K-D's rear Class A Turn Signals become stop lites when brakes are applied . . . tail lites at night.

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K-D LAMP COMPANY

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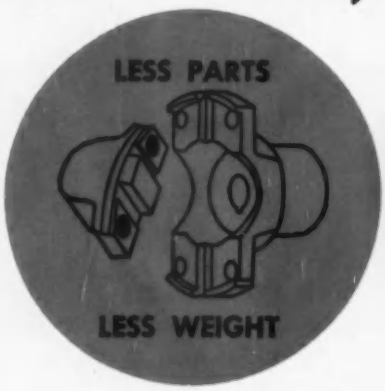
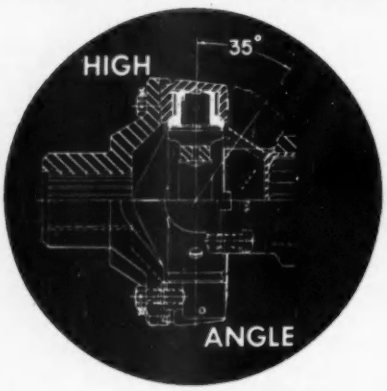
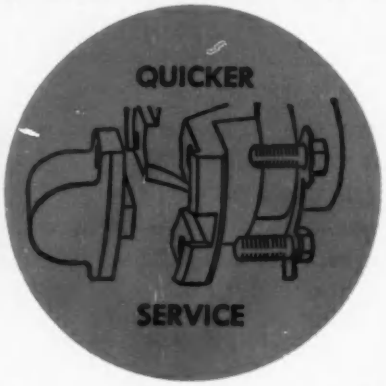
THE COMPLETE LINE Turn Signals, Truck Mirrors, Stop and Rear Lites, Reflectors, Clearance Marker Lites are representative of K-D's complete *single source service* of automotive Saftee Products

MECHANICS

Roller Bearing UNIVERSAL JOINTS







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B.F.Goodrich Chemical *raw materials*

HYCAR RUBBER SAYS "NO" TO FIREWATER DAMAGE

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Hycar nitrile rubber is ideal for this service because it is resistant to oils, tars and other hydrocarbons—as well as salt water. Although tough and abrasion resistant, Hycar is readily molded and extruded to make products with the desired physical properties.

Wherever the going is rough on ordinary rubber, you should investigate Hycar. For information write Dept. KF-1, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Fire-fighting equipment *valves made by Akron Brass Manufacturing Company use Hycar rubber seats made by Jet Rubber and Plastic Company, New Milford, Ohio. Hycar nitrile rubber is supplied by B.F.Goodrich Chemical Company.*

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American Rubber

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News

OF THE AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 120, No. 3 **February 1, 1959**

AMC Earnings Top $21 Million; U.S. Starts Collecting Tax

American Motors earnings for the first quarter of its current fiscal year totaled $21,052,168 for a record-breaking period, and Uncle Sam has started to collect taxes on AMC earnings.

Since the corporation was formed, American Motors has been using a tax carryforward credit to help cover earlier losses. But this credit was used up in the first quarter, which ended Dec. 31. From here on AMC will pay the income tax.

But AMC doesn't need the tax credit anymore. Earnings in the first period were more than four times the profit of $4.9 million earned in the corresponding period a year ago.

Sales totaled $193,743,675 for the three months, a 63 per cent increase over the $118,598,502 sales figure of the 1958 first quarter. Passenger car production amounted to 84,279 cars compared with 41,492 units a year ago.

Part of the record prosperity of the past few years, incidentally, is reflected in bonus payments shared by corporation head George Romney and more than 300 other AMC employes. Proxy statements revealed Romney's salary and bonus total for the year was $200,700. Bonus payments totaled more than $2.8 million.

Ford Div., Doubling Work Force At Lorain, O., Assembly Plant

Ford Div. is planning to add a second shift by next April and double the production rate at its new Lorain, O., assembly plant.

This expansion, according to J. O. Wright, company vice-president and division general manager, is intended to keep up with the current fast selling pace set by Ford dealers.

Although no official word has come from the Ford Div., it is fairly well accepted in Detroit circles that the Lorain plant will be the production site for Ford's new small car. The plant presently has ample unused capacity.

Hiring for the second shift was slated to begin in late January and continue through March to provide job training prior to actual production. Presently, the plant employs some 2350, with 1300 to be added.

Wright said January production schedules were 15 per cent above original plan. By Jan. 7, Ford had built 403,000 1959 model cars, including 17,000 Thunderbirds. Daily production rate during the fourth quarter of 1958, which consisted of 1959 model production, was 56 per cent higher than during the first eight months of 1958.

The Lorain plant, incidentally, assembles the Galaxie series along with the rest of the Ford line (except T-Bird). Galaxie currently is accounting for 33 per cent of the division's passenger car sales.

Eldorado Brougham has custom-built body by Pinin Farina

Cadillac Introduces $13,000 Eldorado Brougham for 1959

Cadillac unveiled its 1959 version of the super-luxury Eldorado Brougham at the Chicago Automobile Show last month. The manufacturer's suggested price remains the same as last year—$13,075.

The new Brougham offers no special optional equipment. Air conditioning, air suspension, Cruise Control, and power steering, windows, and brakes are all regular equipment on every model.

The Brougham is custom-built in Turin, Italy, by Pinin Farina, the stylist who created the Nash Healy and other body styles for Nash-Kelvinator and later American Motors.

Chassis, engine and other components are shipped from Detroit and assembled with the body in Italy. The Brougham is nearly ready for delivery when it is returned to this country.

Cadillac schedules about two of the low-volume, high-price cars a day. Production of the '58 model approached 400 units.

This year's Brougham features a thin roofline with compound windshield and plenty of glass. A unique feature is the automatic rear quarter window which slides into a recess as the rear door is opened, providing more access space. The window closes automatically with the door.

Overall length of the Brougham is 225 in., height is 54.7 in. Engine is Cadillac's 345 hp V-8 with 390 cu in. displacement and 10.5 compression ratio.

NEWS AUTOMOTIVE AND AVIATION

AMC has completed first production pilot models of "Mighty Mite"

First Pilot Models of AMC's Mighty Mite are Completed

First two production pilot models of American Motors' "Mighty Mite" have been completed and are being tested at the corporation's Burlington, Wis., proving grounds.

Four additional models of the 1700 lb airborne vehicle are to be delivered to the Marine Corps before April 30 for further evaluation tests. AMC has an Army Ordnance contract for production of 250 units.

Mighty Mite is being built by AMC's Special Products Div. at a former Hudson plant in Detroit.

The Mite is a four-wheel drive vehicle powered by a 55 hp V-4 aluminum engine developed by AMC engineers. The engine weighs 214 lb or 303 lb with a waterproofed 24-volt electrical system. Displacement is 108 cu in., bore and stroke are 3.25 x 3.25, and compression ratio 7.5 to 1.

Crankcase, cylinders, cylinder heads and pistons are aluminum and cylinder walls are chrome plated. Frame is steel but the body is aluminum.

The M-422 Mite will hit 62 mph maximum speed, climb 100 per cent grades and ford to 60 in., according to AMC officials.

Mack Trucks Introduces "New Look" Transit Bus

Mack Trucks, Inc., unveiled a transit bus with a "new look."

The new Mack coach, now in production, boasts a giant wraparound windshield, dual headlights, and a lower silhouette — all firsts in the transit bus field, Mack claims.

Harold R. Fouss, Bus Div. sales manager, said the new windshield represents a full 100 per cent increase in windshield glass over standard transit buses.

Other features are the Mack Airglide suspension system and the new Mack air-conditioning system, which is offered as optional equipment.

The new coach is powered by Mack's Thermodyne Diesel engine.

Renault Predicts U. S. Sales Of 100,000 Cars During 1959

Renault expects to sell 100,000 cars in the United States during 1959, an increase of some 40,000 from last year's total of 59,968 passenger cars.

Robert E. Balode, vice-president and general manager of Renault, Inc., said 1958 sales were 120 per cent higher than the previous year. Current target of 100,000 units is based partly on the trend at the end of '58 and partly on Renault's plans for a stronger dealer organization. Direct air shipments from the factory in France are part of the company's plans for keeping the 750 dealers stocked with spare parts.

Balode, incidentally, said that recent devaluation of the French franc has had no effect on pricing policies of cars shipped to this country by Renault.

Chrysler Is Shut by New Strike; This One at a Glass Supplier

Labor difficulties have quieted Chrysler Corporation's assembly lines for the fourth time in as many months. This time it was the long strike at Pittsburgh Plate Glass Co., which normally supplies all of Chrysler's glass needs.

First it was the unauthorized walkouts that accompanied the signing and ratification of the general contract with the UAW. Then it was the salaried employes' strike which hurt production when deliveries were halted at the picket lines. And in December, an 18-day strike at Dodge Main in Detroit forced closing of all but Imperial because of parts shortages.

Glass Strike Forces Shutdown

Chrysler was forced to shut down in mid-January because of the glass shortage. Some of the car assembly plants stopped work Jan 16, and the Detroit area and Los Angeles plants worked only a few days the following week. No production was scheduled beyond Jan. 23.

New Mack transit bus features modern styling

THREE-WHEELER

Latest version of the Reliant three-wheeler features improved suspension, larger glass area, and 12-volt electrical equipment. It is powered by a four-cylinder L-head engine of 45-cu in. displacement, rated at 17½ hp at 4000 rpm. Car is produced as hardtop and convertible.

Because the assembly lines were not flowing, Chrysler's manufacturing plants also were hit by the strike.

Although the glass strike already was three months old when Chrysler felt the pinch, Chrysler had lasted fairly well because supplies had been high. The corporation had more glass on hand than usual because car production had been sporadic ever since work began on '59 models.

Pittsburgh normally supplies American Motors and Ford as well as Chrysler, but AMC found another supplier and Ford increased its internal production at Rouge and Nashville glass plants. But Chrysler, presumably because of its unusual compound windshield structure, has not been able to buy elsewhere.

Chrysler also has had troubles on the south side of the Detroit River, where the Canadian operation went on strike at Windsor. Chrysler of Canada had worked without contract since last Aug. 15, was the last of the Canadian Big Three to sign new agreements.

Earlier in January, Ford and General Motors' Canadian operations settled with the UAW on three-year contracts similar to their American counterparts.

Other Labor News

In other labor news, three-year pattern agreements were signed at Harvester, Huck Manufacturing and Electric Auto-Lite. In all three cases the agreements were similar, in nature if not in detail, to the automobile companies'. Harvester had been on strike for two months.

Allis-Chalmers remained the last of the major implement producers to sign. Detroit area tool and die job shops, who had been negotiating for 10 months with two UAW locals, still were without a contract by mid-January. The Automotive Tool & Die Manufacturers Association, which represents 75 job shops, had reached an agreement with the locals, but ratification was delayed.

New Devices Cut Car Exhaust By 90 Per Cent, AMA Reports

The automotive industry has come a long way in its fight to solve the problems of smog caused by car exhaust emissions, according to an Automobile Manufacturers Association report to the annual meeting of the SAE.

Researchers have developed new devices, the report says, that cut hydrocarbon emissions by as much as 90 per cent under some conditions.

Some big problems remain to be solved, however, before any of these methods are made practical and dependable enough for commercial use, the report noted.

Among the drawbacks mentioned by the report are that they require too much warm-up time, produce bad odors, are too big and noisy, and cost too much to operate.

The report stated that three basic types of controls are now under development by Ford, General Motors, Chrysler, and Thompson Ramo-Wooldridge. Two are catalytic converters, which use a chemical in the exhaust system to burn up the hydrocarbon fumes. The third is a flame-type afterburner, which adds air to the exhaust and uses a heat exchanger to burn up the mixture of hydrocarbons and air.

All three devices have been tested in cars under operating conditions, the report said.

Big Three Smaller Car Will Expand Market, Says AMC V-P

Reports from Detroit that the Big Three will bring out a smaller car to match the Rambler and the Lark don't worry American Motors Corp. vice-president Roy Abernethy.

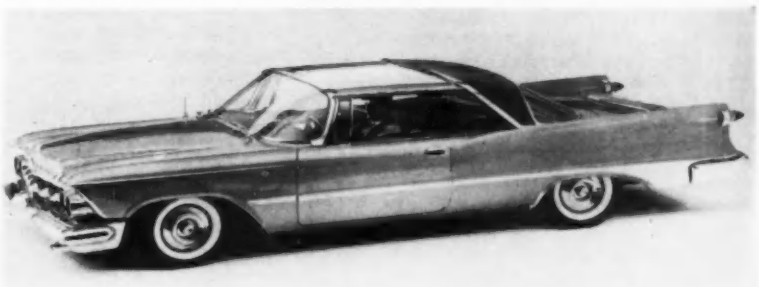
Chief effect of the Big Three entries, says Abernethy, who is AMC vice-president in charge of marketing and distribution, will be to expand the smaller car market, which is as much to AMC's advantage as their own.

Moreover, Abernethy maintains, by launching their own versions of the so-called compact car, the Big Three will be confirming what AMC horn-tooters have been saying all along about the merits of the Rambler.

He lists some of the things the Big Three will be up against: they'll be talking out of both sides of their mouths in advertising two different types of cars; they'll be competing with their own products; and they'll face some pretty big problems of manufacturing and distribution.

AMC will have no difficulty in competing stylistically with the Big Three, Abernethy maintains, but at the same time it will not abandon its stand against "planned obsolescence" or styling for styling's sake.

The AMC vice-president spoke at a press conference in Philadelphia, where he had gone to accept a citation as "Automotive Marketing Man of the Year" from the local chapter of the American Marketing Association.



CHRYSLER IMPERIAL HAS STAINLESS STEEL ROOF

Chrysler's Imperial Southampton hardtop is topped off with a new stainless steel roof that fits over the standard production roof. The roof—an optional equipment feature—is 0.025-in. thick, weighs about 25 lb. It is fabricated from Republic Steel Corp. Type 302 "Enduro" stainless.

NEWS AUTOMOTIVE AND AVIATION

Solid-tired wheels shown here are designed for medium tanks. Wheel at left is a plastic prototype developed by Firestone. At right is steel wheel.

Army Announces Plastic Wheels For Use on Military Vehicles

The Army Ordnance Detroit Arsenal, working with key suppliers and manufacturers, has developed a lightweight plastic wheel which may help furnish a partial answer to the automobile industry's eternal weight reduction problem.

The Army already has produced a glass-reinforced epoxy plastic wheel for military jeeps, according to Willard D. England, Chief, Materials Branch, R&D division of the Ordnance Tank-Automotive Command in Detroit.

England says the Army may design similar wheels for its entire family of vehicles, including cars, trucks, and tanks as well as jeeps. Ultimate goal is development of an all-plastic wheel for tubed or tubeless pneumatic tires.

Plastic Wheel for Tanks

Meanwhile, on another project, the Army developed a plastic wheel for medium tanks which saves 100 lb per wheel, or a gross vehicle saving of 2200 lb over steel wheels. These fiberglass polyester tank wheels take solid rubber tires. Firestone Tire & Rubber Co. is the development contractor.

The jeep wheel was developed in a joint program which included Kelsey Hayes on mold design, Goodyear Tire and Rubber Co.'s aircraft division on the production end, and Minnesota Mining and Manufacturing on the material side of the project.

Wheels Tested

Prototypes of these plastic wheels have been tested out at 4,450,000 revolutions on the Bureau of Standards rim test, which demands 100,000 revolutions of steel. On the spider distortion—or rotary fatigue test — according to England, the plastic wheel went 178,425 revs with a load of 2092 lb. This is six times the requirement for production steel wheels, England pointed out.

In a related project, the Army has developed a universal truck tire, designed to take either tubed or tubeless tires. This project, on which Budd Wheel was contractor, is aimed at relieving the age-old military problem of supply.

GM Cuts Prices on 2 Models Of Opel and Vauxhall Cars

General Motors distributing divisions cut U. S. prices on two station wagon models of the European-made Opel and Vauxhall passenger cars. Both reductions amount to approximately $100.

Buick Div. cut the port-of-entry list price on the Opel Caravan two-door station wagon; Pontiac announced a similar reduction on the Vauxhall Victor Super four-door station wagon. Prices of both wagons are identical: $2095 on the East Coast, $2165 at Great Lakes entry ports, and $2277 on the West Coast.

Edward T. Ragsdale, Buick general manager, revealed that Opel sales are running at more than double the rate of a year ago. A similar sales trend was noted by Pontiac.

Meanwhile, MEL Div. of Ford Motor Company increased the English Ford import line schedules for the first six months of 1959 to 27,000 units. During all of 1958, shipments totaled 39,000 units. English Ford ranks third in sales of foreign cars in this country, behind Volkswagen and Renault.

Senate Committee to Probe Car Financing Practices

Following Ford Motor Co.'s announcement that it will re-enter the automobile financing business, the Senate Anti-Trust and Monopoly Subcommittee has decided to investigate the entire field of car credit.

Sen. Estes Kefauver, committee chairman, said his group is concerned about the "increasing monopolization" of automobile financing. The committee will query representatives of Ford, Chrysler, and General Motors in its upcoming hearings.

GM operates a wholly owned financing subsidiary, General Motors Acceptance Corp. Ford's announcement in January that it would step back into the financing field, gave no details on how the operation would be set up.

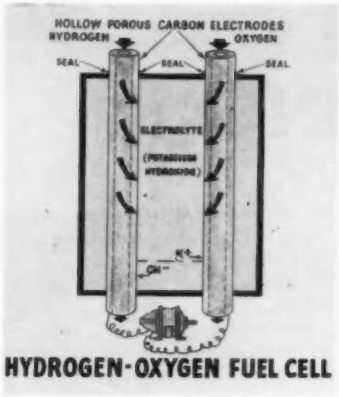
Both Ford and Chrysler had their own financing affiliates prior to 1938.

M-B Forms New Division For Truck and Bus Sales

Mercedes-Benz Sales, Inc., has set up a new truck and bus division for sales of the German-made M-B commercial vehicles in this country. R. L. Hartzell, formerly with Daimler-Benz of North America, Inc., has been named to head the new division. Mercedes-Benz Sales, Inc., is a wholly-owned subsidiary of Studebaker-Packard Corp.

De Soto Studies Fuel Cell As Power Source for Car

De Soto engineers are probing the use of an electrochemical fuel cell and four small electric motors to



Proposed fuel cell for Cella car

power a passenger car in the not-too-distant future.

The De Soto approach to propulsion research is similar in concept to fuel cell projects at Lockheed, Ford and other laboratories (see AI Dec. 1, 1958, p. 21).

But De Soto has gone beyond study of just the fuel cell as a power source. It has also come up with an "idea car," which it calls the Cella I.

The fuel cell, described by chief engineer A. E. Kimberly, would generate electric energy through the chemical interaction of hydrogen and oxygen. Current would drive four high-speed, lightweight traction motors geared individually to the wheels through universal-jointed shafts.

Wheels would be independently suspended and a system of differential speed governors would prevent any wheel from varying more than a set percentage from the average speed of the other three.

Kimberly points out this would minimize wheel spin, provide better traction and control on acceleration, and assist in checking wheel lock.

An important advantage would be the nearly 100 per cent power recovery through dynamic braking, which would regenerate current in the cell during normal stop and go driving. This would result in bonus fuel economy and a reduction of up to 25 per cent in brake weights, according to Kimberly.

Reversing the field current flow would reverse car direction. Other advantages include absence of motor noise and fewer moving parts.

Kimberly believes three major breakthroughs will be needed to shorten the time factor in development of an experimental fuel cell car: a better way to store and supply hydrogen and oxygen gases to the cell; and development of a high-output, lightweight cell and a high capacity, lightweight battery.

AI TABLOID

An electronic vacuum tube that is claimed to use less than half the power of conventional tubes and last longer than the equipment it serves has been developed by Tung-Sol Electric, Inc. in cooperation with the Signal Corps. Instead of a heating element, the tube uses a high-voltage field to cause electron flow from a tiny nickel cylinder coated with magnesium oxide.

* * *

A new automotive glass that combines the best properties of plate glass and fire-finished sheet glass now can be made by a new process that eliminates grinding and polishing, says the British firm of Pilkington Brothers Ltd. Briefly, the process consists of passing a continuous ribbon of glass from the furnace and floating it on the surface of a molten metal at controlled temperature.

* * *

A new ion exchange resin that can be used to remove traces of heavy metals from product streams or to separate various heavy metals is being produced on commercial basis by Dow Chemical Co. Because of its high selectivity the product (Dowex Chelating Resin A-1) can separate many closely related ionic species, such as nickel from cobalt, and copper from nickel, Dow says.

* * *

Titanium tubing now can be bent sharply and safely on a radius as little as its own outside diameter, says Superior Tube Co. The new technique, developed by Kresiler Industrial Corp., consists of bending the tubing by drawing it around a rotating bending form. It is held in position under pressure and supported by special moving clamps, dies, and mandrels.

* * *

Crucible Steel Co. is marketing a new hard-facing welding alloy for hot work applications that is claimed not to chip or spall under the severest conditions. In recent field tests, the new material — a cast nickel-chromium-molybdenum-tungsten alloy called Rexweld 66 —was reported to have outperformed all other types of hard facings in its primary application, drop hammer forging dies.

Ethyl Corp. scientists are using carbon-14 and two isotopes of hydrogen-deuterium and tritium to determine the amount of fuel each cylinder in an automobile engine is getting. Ethyl scientists tag a fuel component—either hydrocarbon or additive—with one of these radioactive elements and then take a radiation count of the samples picked up by quick-acting sampling valves, which also double for conventional spark plugs in these studies.

* * *

Buick Motor Div. announced it has increased the minimum nickel thickness on plated parts of 1959 models by 60 per cent. The thicker nickel plating will provide greater protection for plated parts against corrosion by de-icing salts, exhaust fumes, etc.

* * *

Westinghouse design engineers are putting the finishing touches on a digitally programmed analog computer. The computer will get data in analog form and put it through a basic arithmetic unit that can add, multiply, etc. The new computer will be useful in such applications as the Westinghouse track-while-scan radar equipment, where multiple targets are involved.

* * *

Development of a new family of lower cost, iron-aluminum-manganese alloys is reported by National Research Corp., Cambridge, Mass. The new alloys combine light weight, excellent cold workability, high-temperature strength (above 1200 F), and oxidation resistance (up to 1500 F), NRS says.

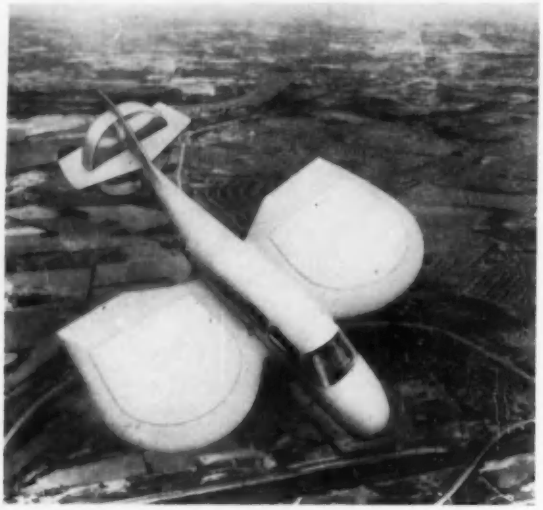
* * *

Georgia Div. of Lockheed Aircraft Corp. claims it has made successful tests on a rig for a jet-powered airplane that will take off and land vertically, and fly horizontally.

* * *

Sylvania-Corning Corp. announced it has developed the first of a series of standard elements for nuclear reactors. It now is possible, the company says, to produce finished fuel elements for inventory and, hence, to design nuclear reactors "on a foundation of available standard fuel elements."

AVIATION MANUFACTURING



VTOL PLANE

Model of a new VTOL airplane being built by Vanguard Air and Marine Corp. is shown as it will look in forward flight. A full-sized prototype, near completion, is designed to operate from heliports, lawns, and parking lots. Vertical lift is obtained from shrouded propellers in the wings. Large closures convert the wings to high-lift surfaces in forward flight.

Manned Space Capsule to Cost Over $15 Million, NASA Says

Plans for the first U. S. man-carrying space capsule call for another two years of work at a cost of over $15 million, according to the National Aeronautics and Space Administration.

McDonnell Aircraft Corp., winner of the NASA Project Mercury contract, has been working for over a year on engineering the space capsule. Twelve companies, including such space age leaders as North American Aviation, Boeing, Convair Div. of General Dynamics Corp., submitted proposals for the project.

Purpose of the Project Mercury capsule will be to study the psychological and physiological effects of space flight on man.

An Atlas ICBM will be used initially to put the manned space capsule into a nearly circular orbit 100 to 150 miles from earth. It would stay in orbital flight for 24 hours and then be brought back to earth by "retro rockets" and special parachutes.

The capsule will have an extremely blunt nose covered with a heat shield to enable it to withstand any combination of forces it may be subjected to at blastoff or during re-entry through the earth's atmosphere.

One of the main problems to be solved by McDonnell scientists is the stabilization of the capsule so that it will not tumble or roll end-over-end as do present satellites.

North American Names Three Firms to F-108, B-70 Teams

North American Aviation, Inc. named three firms to the teams now working on the F-108 interceptor and the B-70 intercontinental bomber.

Convair (San Diego), a division of General Dynamics Corp., was chosen to design and build the wing of the F-108 Mach 3 interceptor.

Lockheed Corp.'s Georgia Div. got the contract for the fuselage section of the B-70 Valkyrie bomber, and Chance Vought Aircraft Co. for the horizontal and vertical stabilizer sections.

Raymond H. Rice, North American vice-president and general manager of the Los Angeles Div., said that 21 companies submitted bids on the B-70 tail section, and 20 on the fuselage. The Los Angeles Div. is weapons system manager for both aircraft.

Rice said that North American has made "great strides" toward solving the problems of new metals and manufacturing techniques. Under the new weapons system manager concept, he added, all of this know-how will be made available to firms working with North American on these projects.

Bendix Aviation Reports Drop In Sales, Earnings in 1958

Bendix Aviation Corp. reported declines in sales and earnings in the fiscal year ended last Sept. 30.

Malcolm P. Ferguson, president, reported that net income fell to $21,171,902, or $4.18 a share, from $27,499,034, or $5.44 a share, in the previous fiscal year. Sales totaled $619,138,095, compared with $706,984,631 in fiscal 1957.

The decline was attributed to a decrease in automotive business and to military cutbacks. Sales of Bendix

(Turn to page 46, please)

SECOND CONVAIR 880 STARTS "FLYING IN PLACE" TESTS

Second Convair 880 jet transport is rolled out to begin its nine-month structural test program at San Diego, Calif. Aircraft has been equipped with tension pads and also with metal straps on the fuselage. Simulated flight loads will be applied by attaching whiffletrees to the pads and straps to flex the wings and fuselage. First 880 was rolled out in December; seven more are in major assembly.

MEN IN THE NEWS

Reynolds Aluminum Sales Co. — Keith E. Hall, general manager of industrial market sales, was elected a vice-president.

Norton Co. — Donald L. Price was elected a vice-president and Robert Cushman succeeds him as sales manager, grinding wheels.

Pangborn Corp. — Ralph M. Trent has been elected president.

Bell Telephone Laboratories—**Dr. James B. Fisk** was elected president.

Whitehead Metals, Inc.—**Clayton D. Grover** was elected chief officer.

GMC Truck and Coach Div., General Motors Corp.—**C. F. Dick** was named general sales manager in charge of coach sales activities.

Ford Motor Co.—**D. S. Harder** has retired as vice-president and technical advisor to the president and chairman of the board.

Youngstown Sheet & Tube Co.—**Thomas G. Lewis** has been appointed purchasing agent, and **Richard J. Stamberger** was made manager of the new Trade Relations Dept.

Norton Co., Grinding Machine Div.—**Wilfred R. Ogg** was named manager of distributor sales.

United States Rubber Co.—**Walter F. Brown** was named director of automotive sales and **Herbert D. Smith** general sales manager, U. S. tires division.

Surface Combustion Corp.—**A. T. Enk** has become manager of the Design Dept.

Robertshaw-Fulton Controls Co., Fulton Sylphon Div. — **Paul E. Cate** has been named director of industrial and production engineering.

Eaton Mfg. Co.—**Howard R. Johnson** has been promoted to general manager of the Valve Div. and **Melvin L. Zuehlke** to general manager of the Saginaw Div.

Westinghouse Electric Corp.—**Howard S. Kaltenborn** was named vice-president and assistant to the president, and **Dr. S. W. Herwald** was elected vice-president in charge of research.

Jones & Laughlin Steel Corp., Stainless and Strip Div.—Russell H. Loutzenhiser was named vice-president—production, and **Eugene V. Mort** general manager—production.

Yale & Towne Mfg. Co.—**Elmer F. Twyman** has been elected senior vice-president.

Controls Co. of America (Canada) Ltd.—**Dan O'Leary** has been elected president.

Fisher Body Div., General Motors Corp.—**Donald W. Fleser** was made general factory manager of trim fabrication.

Thompson Products, Ltd.—**Russell S. Kenerson** was elected president, succeeding **George A. Stauffer**, who was named chairman of the board.

AC Spark Plug Div., General Motors Corp.—**Morriss W. Allen** was named technical assistant to the equipment sales manager and **J. Alex Dunn** supervisor of cost estimating.

General Electric Co., Chemical & Metallurgical Div.—**John T. Castles** has become manager of the chemical development operation.

U. S. Steel Corp., National Tube Div.—**Louis W. Mason** was appointed sales manager—eastern area; **James G. Morrison**, sales manager—central area; **James P. Bacon**, manager—tubing specialties products; **James H. Degnan**, manager—oil country tubular products; and **George O. Nations**, manager—standard pipe products.

Reed Roller Bit Co., Cleco Div.—**E. W. Clayton** has been promoted to sales manager.

Timken Roller Bearing Co. — James W. Pilz has been appointed district manager, Automotive Div., in Detroit.

Air Reduction Sales Co.—Dr. Albert Muller has been appointed vice-president.

Necrology

John M. Taylor, Sr., 67, founder and past chairman of the board of Taylor Fibre Co., died Jan. 13, at Villanova, Pa.

Leonard C. Strobeck, 58, a retired vice-president of Dayton Rubber Co., died Jan. 7, at Dayton, O.

Charles S. Redding, 75, chairman of the board of Leeds & Northrup Co., died Jan. 2.

John E. Obernesser, 65, former works manager of the Milwaukee plant of International Harvester Co., died Jan. 2, at Burlington, Wis.

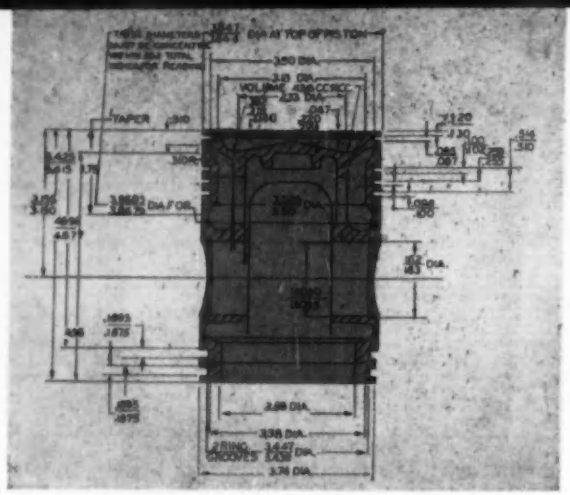
Edward S. Jordan, 76, an automotive pioneer and founder of the Jordan Motor Car Co., died Dec. 29, at New York City.

John P. Toner, 46, assistant chief engineer, Arma Div., American Bosch Arma Corp., died Dec. 25, at Halesite, L. I.

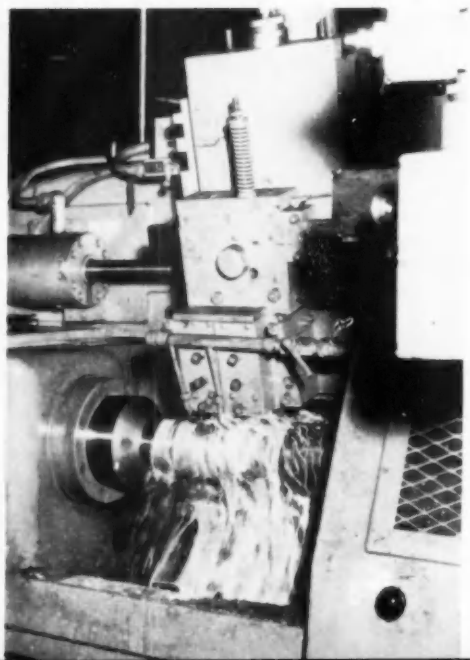
Dr. William R. Veazey, 75, former research consultant for Dow Chemical Co., died Dec. 23, at Youngstown, O.

Machining Pistons for Detroit Diesel Engines

By Joseph Geschelin



Series 53 engine piston



First major operation on the 53 piston takes place in this Reedmatic heavy duty lathe.

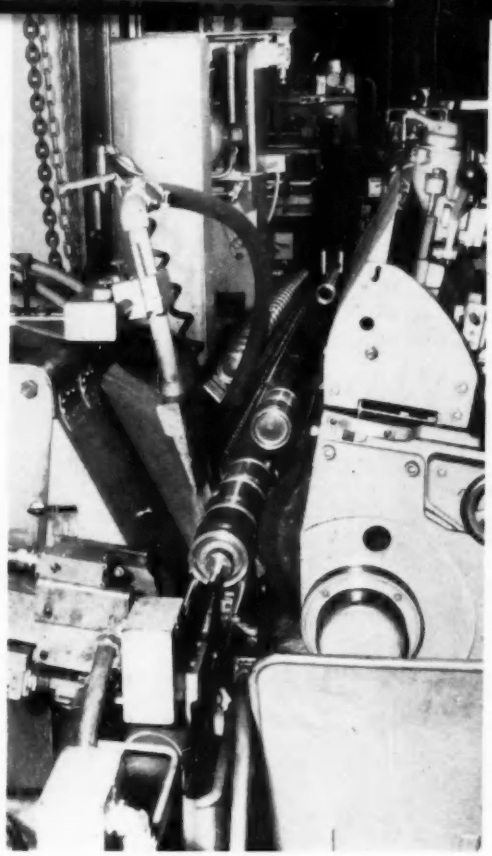
Finishing operations on the dome, oil grooves, etc., are handled in the Bullard Hydra-Feed lathe seen here.

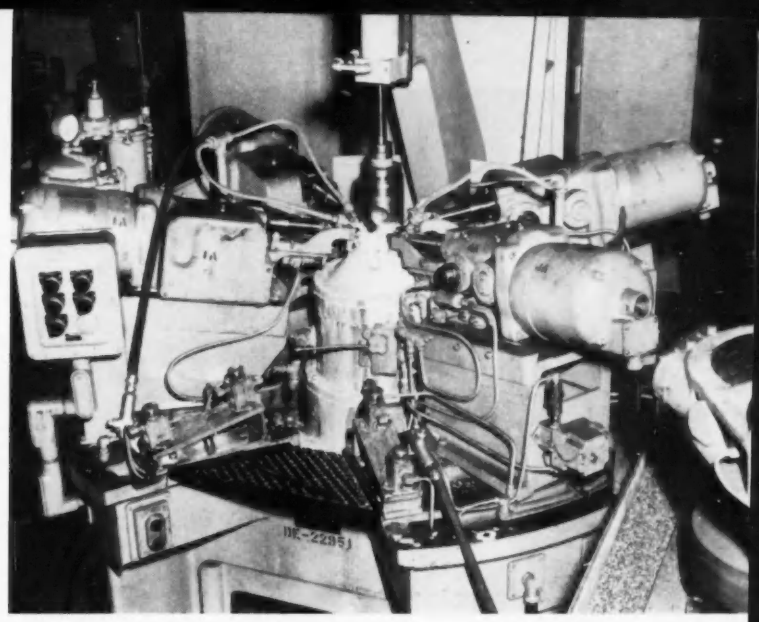
COINCIDENT with the announcement of its new and expanded line of engines (see AI, January 1, 1959) Detroit Diesel Engine Division has been engaged in completing a 280,000-sq ft addition to its manufacturing facilities. This new building contains machine lines for cylinder heads and cylinder blocks, as well as other components for the Series 53 and 71 engines; mechanized assembly lines for engines; engine test room; and other facilities.

Since this article was prepared before the major machine lines were in full operation, it will serve as an introduction to the new plant, highlighting final assembly and the fully mechanized machining line for the Series 53 piston.

A drawing of this piston, a scaled down version of the 71 design, is shown here to indicate some of the major machining operations as well as the range of tolerances.

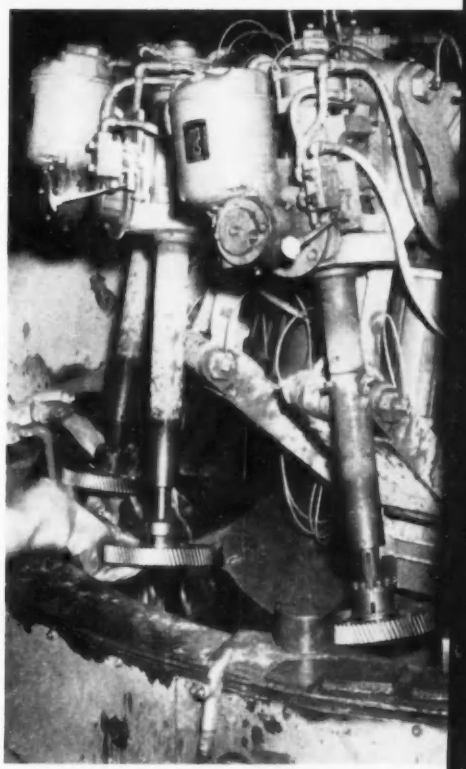
A pearlitic malleable iron (Armasteel) casting, the piston is processed completely along a very compact line. The following gives a brief summary of major operations:





One of a number of special drilling machines, this Kingsbury does the drilling of the two rows of smoke holes in the 53 piston.

Pistons going through the Cincinnati Centerless grinders for OD grinding.



Interesting example of specialization is the Mechamatic deburring machine which has been adapted for the burring of edges of all gear teeth in a variety of engine gears. Machine is responsible for considerable economy.

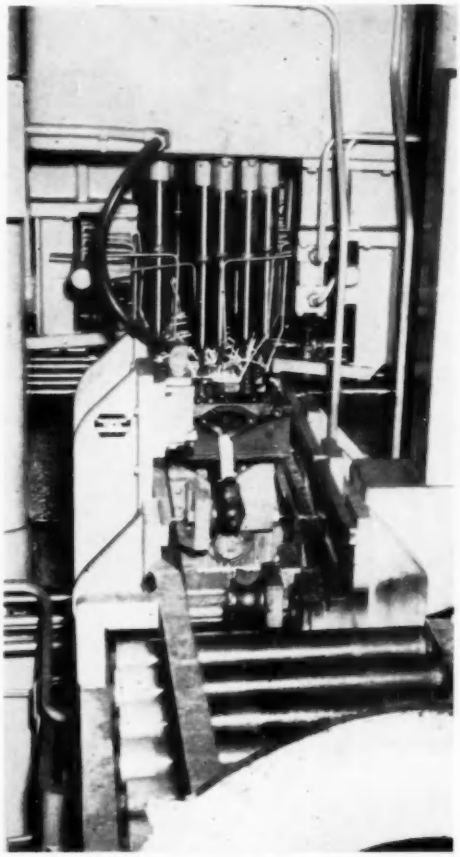
OPERATION	MACHINE
Finish-face, skirt end; rough-face dome end; rough center skirt end and dome end; rough-turn OD	Reedmatic Heavy Duty Lathe
Recenter dome end and skirt end	Cincinnati-Bickford Drill Presses
Finish-face dome end; finish-turn oil groove relief lands; rough-turn all ring grooves; finish-turn OD and taper	Bullard Hydra-Feed Lathe
Rough centerless grind OD and taper	#3 Cincinnati Centerless Grinder
Core-drill pin holes	Two-spindle Kingsbury
Rough- and finish-bore pin hole and cut counterbore, both ends	Mod. 222 Heald Borematic Two-Spindle, double-end
Rough- and finish form dome contour	Natco horizontal Drill with Special Tooling
Press-in two pin bushings	4-ton Denison Hydraulic Press
Drill two rows of oil drain holes (16, 3/32-in. holes, rows staggered by 22½-deg)	Four-Spindle Kingsbury Drill
Balance for standard weight	GM Piston Weight Mill
Regenerate skirt center to finish size	#112D Ex-Cell-O Precision-Boring Machine, Single-End
Finish-grind OD ring lands and taper (taper checked with P & W Sigmatic Comparator)	10 x 18 Cincinnati Plain Grinder
Finish-bore the two pin bushings (1.3775-1.3780 in.)	Ex-Cell-O Precision Boring Machine, single-end
Tin plate in automatic machine	
Finish-turn ring grooves; burr compression ring grooves	#12 Gisholt Masterline Hydraulic Lathe
Burr oil ring grooves; remove tin from compression ring grooves; burr and polish dome end	LeBlond Automatic Rapid Production Lathe
Final inspection	

One of the noteworthy features of piston machining is the use of carbide throwaway wafers on certain operations. They have exceptionally long life and account for a considerable economy in tool management.

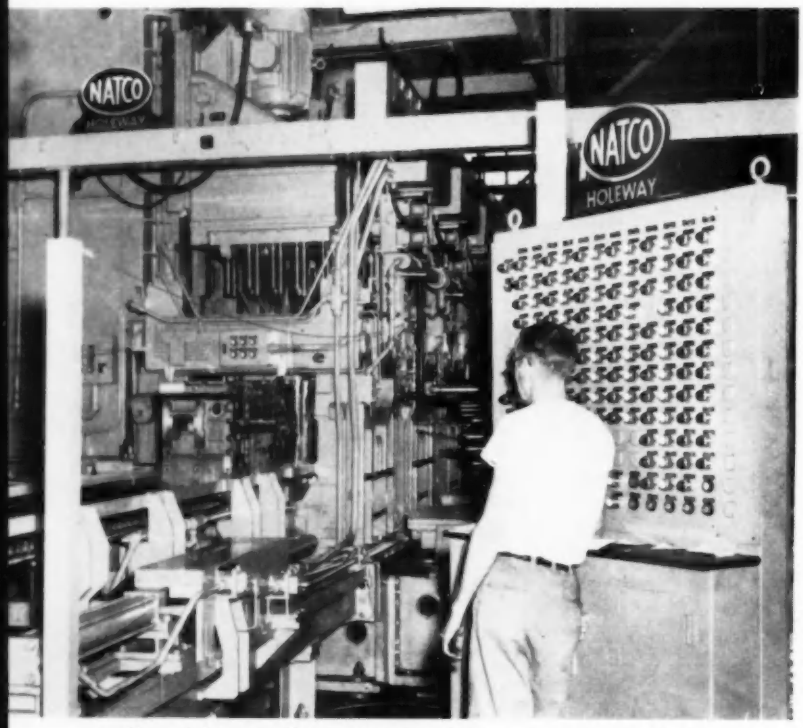
Turning to the engine final assembly department, it may be noted that there are three fully mechanized lines; one each for the inline 53, inline 71, and V-71. The conveyor systems for this complex were installed by Mechanical Handling Systems. The following description and picturization is concerned with the inline 71 which is typical of the other two.

Engine assembly starts on the overhead conveyor system with its massive suspended fixtures. The conveyor has a straight run of about 150 ft and is provided with 16 working stations. This type of conveyor lends itself admirably to operator convenience and comfort since the operator can stand close to the work and can position it readily to suit the requirements of

The Kearney & Trecker milling machine shown here handles the rough milling of 53 cylinder heads in preparation for succeeding operations.



Greenlee three-way tapping machine for tapping oil holes in 53 cylinder heads.

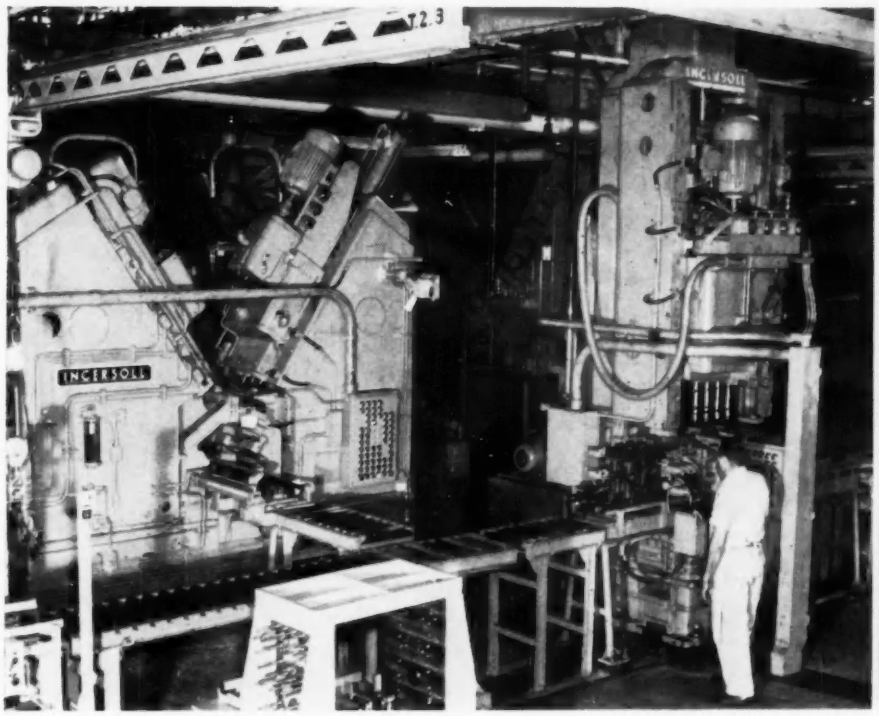


Loading station of Natco transfer drilling machine on the 53 cylinder block line.

a given station. Operation on this line begins with the attachment of the cylinder block at the first station.

As the engine approaches the end of the line, it reaches a fixed elevator station. Here the fixture is lowered to position the engine on the assembly buck riding the flat top floor conveyor which constitutes the final stages of assembly. As the engine is removed from the suspended fixture, the elevator raises it to the rails on the upper level of the overhead conveyor, and from this point the fixture is transported automatically to the start of the suspended assembly line.

At the end of the flat top conveyor, engines are lifted off by means of a hoist and transported to an adjacent dress-up line. At the end of the line engines are ready for the test schedule on test stands.



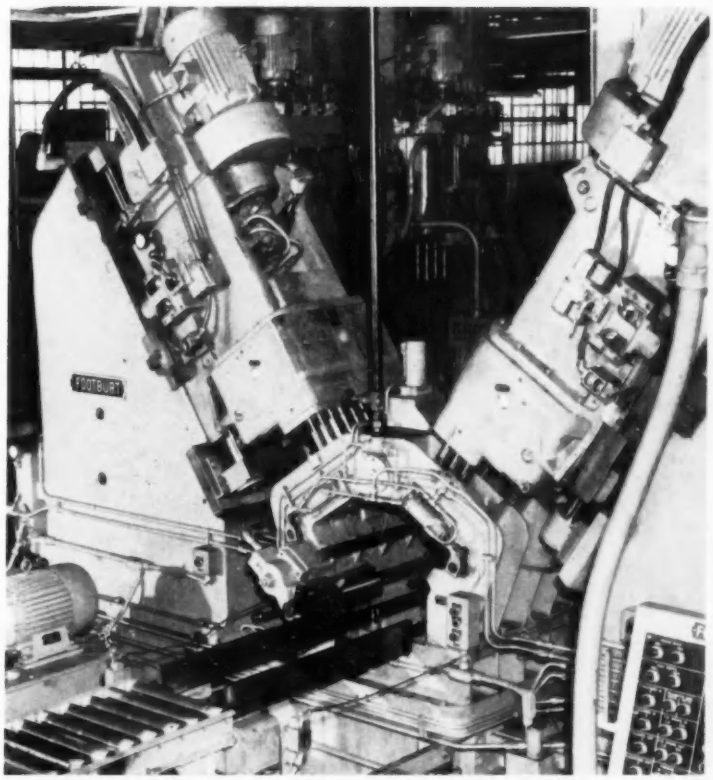
Cylinder bearing divides at this junction. Inline blocks go through the vertical Ingersoll at the extreme right; V-blocks are shunted to the V-type Ingersoll rough-boring machine at the left.

The company has worked out an ingenious scheme for storing engines, transporting them into the test department, and scheduling to test stands. This is accomplished by means of the Jervis B. Webb Towveyor system. The individual cars are loaded with engines, then proceed in a serpentine path into the test room. The Towveyor track circumscribes the two banks of test stands, making it possible for the operators to stop the car at any station for loading our engine into an empty test stand. Stopping any car will stop the entire line until the car is restarted on its journey back to the starting point.

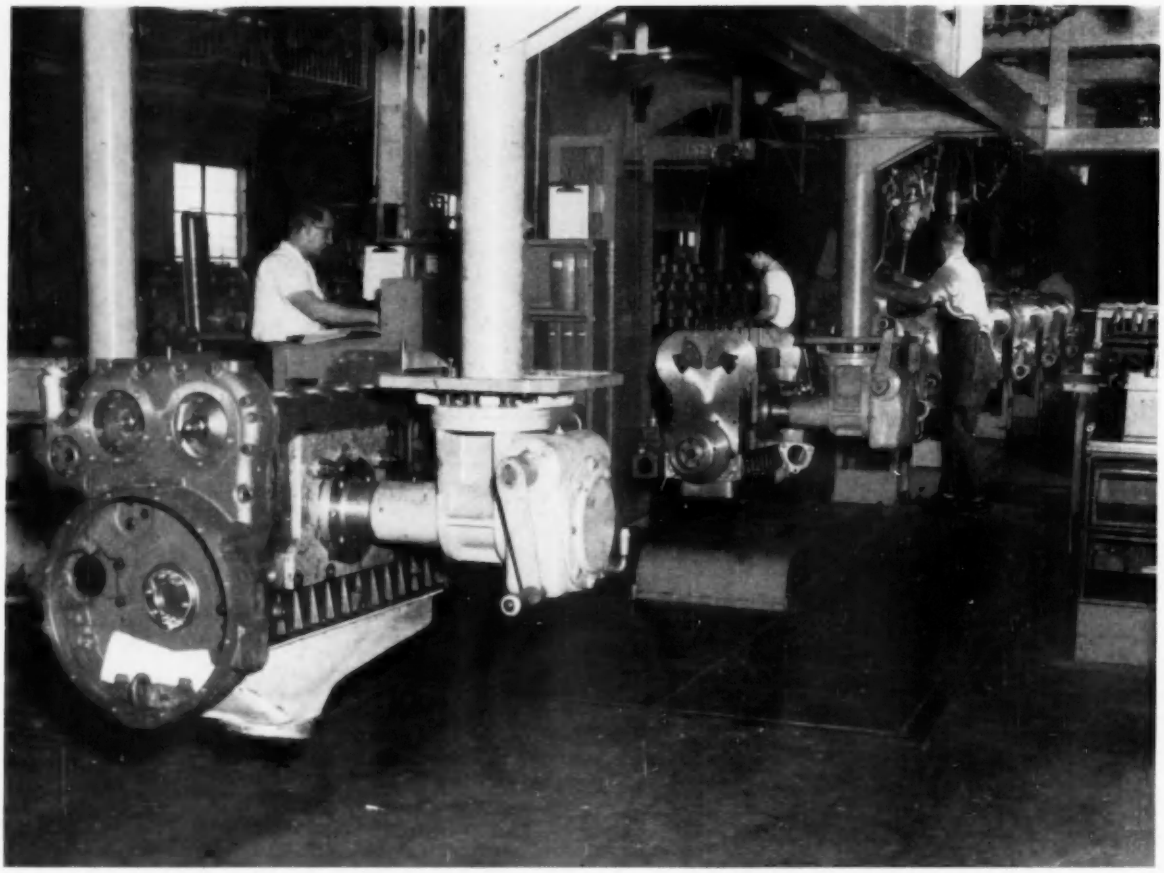
The main test room is equipped with a battery of 70 test stands, featuring the latest types of General Electric dynamometers, GE controls and indicating instruments.

There are four additional test stands in another room, for testing multiple units plus a special test department containing eight stands for full scale testing of assembled package power units.

(*Continued on next page*)

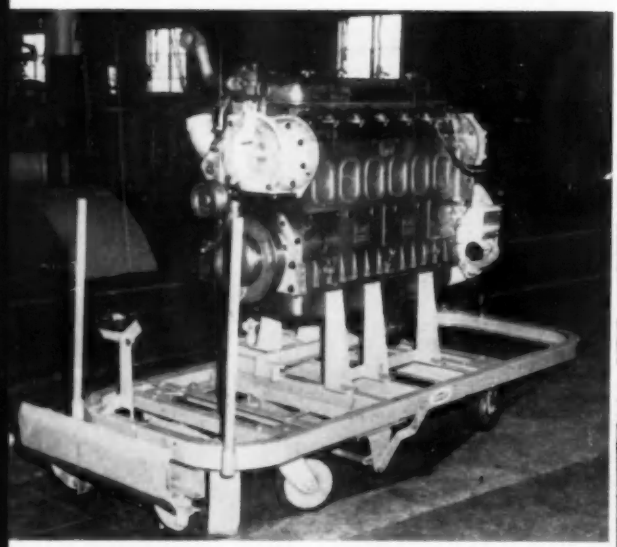


Water and oil line holes for V-type blocks are tapped in this Footburt machine.



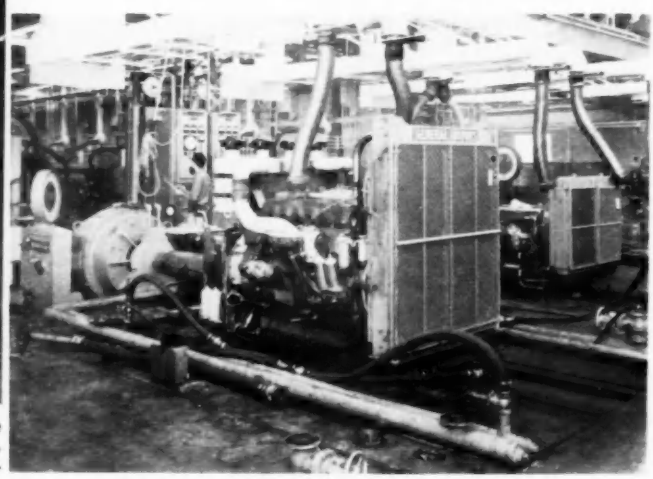
Start of engine final assembly. Here the massive cylinder blocks are mounted on the fixture and transported along the assembly line on the heavy duty overhead conveyor system.

We also show an illustration of a Mechamatic deburring machine which is responsible for major economy in burring the edges of all timing gears and most of the other gears used in the engine train. ■



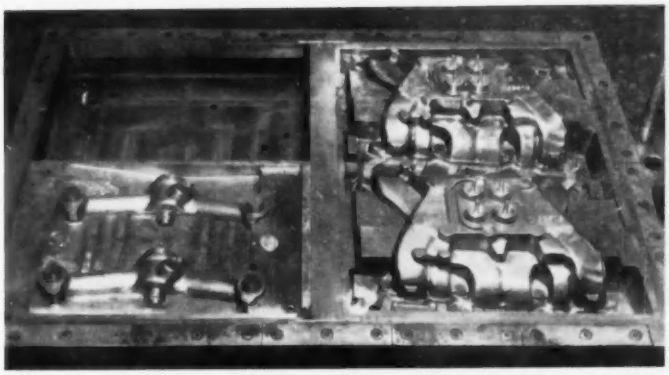
Completed engines, ready for dynamometer testing, are mounted on one of the Towveyor trucks shown here. Towveyors are guided and drawn by track on the floor.

Detroit Diesel not only tests the basic engines, they also make a full schedule of dynamometer tests on assembled package units. This view shows two package units undergoing testing on the new General Electric dynamometers.

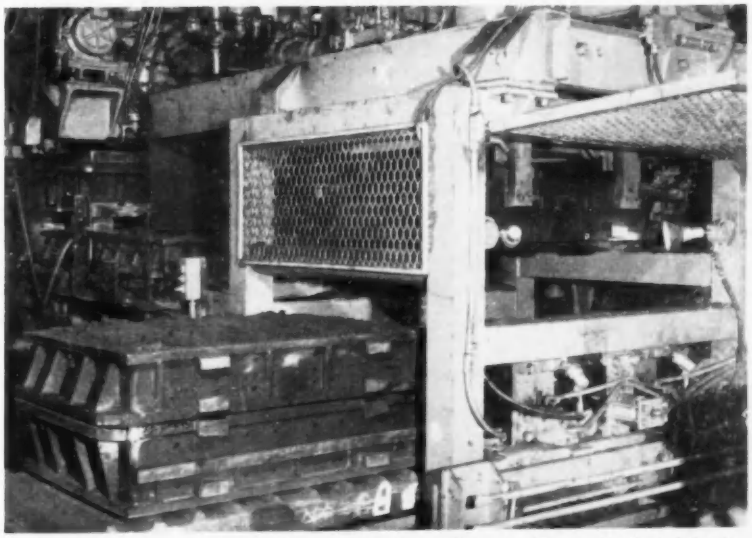


Buick's Fully Mechanized Foundry

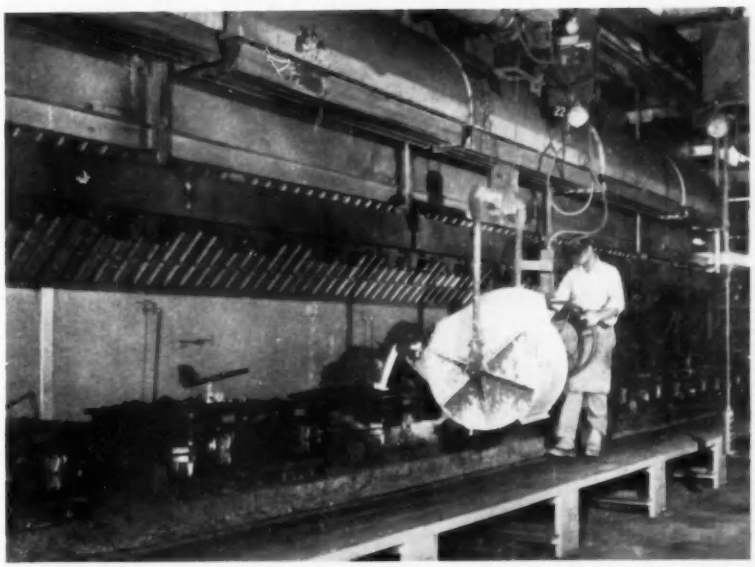
By
Joseph Geschelin



Typical insert type pattern equipment developed for the new mechanized foundry department. The insert at the top left hand corner was removed to show detail of this interesting pattern design.



The cope is prepared in the automatic molding machine extending into the background at the left, then loaded accurately on the drag as the molding conveyor traverses the positioning station in the foreground.



The molding conveyor proceeds on its course to enter the pouring station in this view.

OUT of the many items of advanced production equipment installed by Buick for 1959 cars, we have selected a noteworthy example to illustrate the progress being made in many directions. The object of this article is to provide a brief description of outstanding mechanization in the foundry.

Here is an excellent example of a fully mechanized line for production molding and pouring, including shakeout, in an extremely compact arrangement. The molding line produces various castings used in the engine assembly and employs a set of Spomatic, fully automatic cycle, jolt-squeeze molding machines for preparing the cope and drag at separate stations.

A unique feature of the engine parts line is in the use of insert type patterns. This makes it possible to mold a large variety of different parts at one time, any desired selection of parts being scheduled simply by using suitable inserts.

The pattern can handle any combination of intake manifolds, three different kinds of exhaust manifolds, water manifolds, oil pump bodies, or rear pump bodies.

In operation, the drag section is prepared in the automatic molding machine at the start of the line, then moved automatically out of the machine, turned over, and deposited on a car type conveyor by means of a transfer mechanism. Further along the mold conveyor

(*Turn to page* 64, *please*)

Latest
in Automotive Developments
Among Subjects
at the Society's
Largest Event of Its Kind

By
Charles A.
Weinert

Annual Meeting of the SAE

POWER steering, brakes, engines, and the aerial jeep were among the many subjects discussed at the Annual Meeting of the Society of Automotive Engineers.

Automobiles, trucks, jet aircraft, and even nuclear aircraft, as well as rockets and missiles, all received attention on the program—which, with 87 technical paper presentations, was undoubtedly SAE's biggest ever. The discussions were centered on the very latest in automotive developments—and a great number were detailed for the first time at this meeting. Topics included—in addition to those already mentioned—high-temperature materials and lubricants, seals, radioisotope applications, automatic transmission fluids, and a new truck tractor. Also ground equipment and facilities for aircraft and missiles, exhaust gas control, fuel and performance testing, cost reduction, and interesting prophecies on the design of 1980 automobiles—among others almost too numerous to mention.

Held in Detroit during the full week of January 12, the meeting was actually comprised of several major sectors. On the program, besides 30 technical sessions, were the annual business session; administrative, activity and technical committee meetings; a luncheon meeting of the Production Activity; and the annual banquet, held at Detroit Masonic Temple. Another main feature was SAE's Engineering Display, where 73 leading suppliers of automotive components and materials exhibited their newest products and product applications.

The overall program, as can be visualized, was not only more comprehensive, but also more diversified in scope than heretofore. It attracted a sizable attendance of some 5500 executives and engineers from the industry.

New Officers

At the annual business session, the election of 1959 officers was announced. New SAE president is Leonard Raymond, chief automotive engineer, research, Socony Mobil Oil Co., New York. B. B. Bachman, director of engineering, Autocar Div., White Motor Co., was re-elected treasurer. The vice-presidential electees who will represent the various professional activities in 1959 are given in the list at the left. (*Continued on page* 32)

SAE OFFICERS
for 1959

President

Leonard Raymond, Socony Mobil Oil Co.

Treasurer

B. B. Bachman, Autocar Div., White Motor Co.

Vice-Presidents

Air Transport—G. W. Gilmer, III, Arabian American Oil Co.
Aircraft—W. C. Heath, Solar Aircraft Co.
Aircraft Powerplant—E. J. Manganiello, National Advisory Committee for Aeronautics.
Body—J. W. Shank, Engineering Div., Chrysler Corp.
Diesel Engine—R. R. Robinson, Caterpillar Tractor Co.
Engineering Materials—C. F. Nixon, Research Laboratories, General Motors Corp.
Fuels and Lubricants—Lloyd Withrow, Research Laboratories, General Motors Corp.
Passenger Car—F. R. McFarland, Buick Motor Div., General Motors Corp.
Production—Anderson Ashburn, American Machinist
Tractor and Farm Machinery—F. P. Steiner, International Harvester Co.
Transportation and Maintenance—W. E. Thill, Federal-Mogul-Bower Bearings, Inc.
Truck and Bus—R. W. Wantin, Ford Div., Ford Motor Co.

Councilors

J. H. Famme, Convair Div., General Dynamics Corp.
N. C. Penfold, Automotive Research Associates.

New Equipment and New Materials in SAE Technical Papers and Engineering Display

Engines—Diesel, Series 53, two-stroke; two, three and four cylinders in-line, and V-6 (Detroit Diesel Engine Div., GMC) (AI January 1, 1959).

Engine—Diesel, Model TCD-298, turbocharged, six cylinders, 3¾ in. bore, 4½ in. stroke, displacement 298 cu in.; rated 175 hp at 3000 rpm equivalent to 4.85 lb/hp (Hercules).

Engine—horizontal, gasoline, Model 590, six cylinders, 5 in. bore and stroke, displacement 590 cu in., rated 242 hp at 2800 rpm (Hercules Hall-Scott).

Engine—V-8 gasoline, 5¼ in. bore, 4⅞ in. stroke, displacement 844 cu in., rated 325 hp at 2600 rpm with 7.5:1 compression ratio (Waukesha Roiline).

Engine—aircraft, Model 10470-C, gasoline, equipped with new "continuous-flow" fuel injection system; six cylinder opposed, with 5 in. bore, 4 in. stroke, displacement 471 cu in., rated 250 hp at 2600 rpm (Continental).

Pistons—aluminum, with continuous cast-in steel top ring section (Zollner).

Pistons—bi-metal two-stage compressor; cast-iron locomotive Diesel; types G and E aluminum with cast-in wire insert in top ring groove (Gillett & Eaton, Inc.).

Cylinder and Piston Assembly—aircooled, made of high silicon-content aluminum alloy (Gillett & Eaton, Inc.).

Piston Ring—101 twin, combining compression ring and oil ring in one piston groove, for a total of two grooves per piston (Perfect Circle).

Valve Seals—with Teflon sealing member centered in synthetic rubber thimble (Perfect Circle).

Brake Drums—aluminum, and integral hub and drum assembly (Kelsey-Hayes).

Brake Drum — bi-metal, aluminum with bonded-in steel liner (Gillett & Eaton, Inc.).

Brake—multi-shoe, for off-the-road vehicles (B. F. Goodrich).

Hand Brake—multi-stroke lever control (Fawick.)

Air-Power Brake Unit—for passenger cars equipped with air pressure supply of 150 psi (Kelsey-Hayes).

Air Brake Control—incorporated into steering column to eliminate problem of driver knee room (Ross Gear & Tool).

Power Steering Gears—(Lincoln, Saginaw, and Bendix) (AI April 1 and October 1, 1958).

Variable-Ratio Gears—steering, display gear of 7/20/7 ratios (Ross Gear & Tool).

Power Steering Assemblies—cylinder and valve, operating at 2000 psi, for axle loadings up to 140,000 lb (Vickers).

Starting Motor Drives—more compact, and including designs using rubber in place of drive springs (Bendix).

Transmission System—for trucks, Presto-Matic, including transmission, clutch and servo air cylinder, controlled from top of gearshift lever (Dana Corp.) (AI January 1, 1959).

Casting Alloy—Tens-50 aluminum, developed for rocket-engine turbopumps (North American Aviation).

Stainless Steel Parts—cylinder head gaskets; combination exhaust manifold gasket and heat shields; bumper; experimental pillar post and head rail sections, comprised of stainless parts welded to carbon steel members (Committee of Stainless Steel Producers, AISI).

Tire Cord—viscose (Tyrex Inc.).

Filters—for operation up to 1500 F, and with micron particle ratings (Bendix).

Final Drive—farm tractor gearing with 15:1 reduction and three-tooth hypoid pinion (Borg-Warner).

Bumper Insert—Adiprene-L urethane rubber, scratch-resistant and translucent, applied as red rear bumper insert (Du Pont).

Springs—Belleville spring washers of glass fibre impregnated with epoxy-type resin for corrosion resistance (Associated Spring).

Towing Stabilizer — incorporating hydraulic telescoping type dampers (Fawick).

Lubricants—fluoroester, for applications to 550 F (Du Pont).

Lubricants—solid film, for 1000 F and above, composed of synthetic graphite, lead oxide and porcelain enamel binder (Electrofilm, Inc.).

Ceramic Coatings—thermal insulation, aluminum phosphate bonded alumina, zirconium phosphate bonded zirconia, for maximum service temperatures of 3500 and 4000 F respectively (Marquardt Aircraft).

Aluminum Parts—trim, bumpers, grilles, brake drums, cylinder heads and blocks, etc., representative of current and potential applications (Alcoa, Kaiser, Olin Mathieson, Reynolds).

Vehicles—nuclear-shielded tow tractor and salvage unit (Convair).

Vehicles—missile ground (Chrysler).

Vehicles—electrical ground power for commercial jet aircraft (Motor Generator Corp.).

Aerial Jeeps—development prototypes (Chrysler, Curtiss-Wright and Piasecki).

Highway Tractor—lightweight design (GMC Truck & Coach) (AI November 1, 1958).

Ground Units—prototype loading stands, tractors, and engine starting unit for jet transports (United Airlines).

Gas Turbine Car—Firebird III (General Motors Corp.).

Technical Sessions

Power Steering: Significant advances in 1959 power steering gears were made evident during the session devoted to present and future developments along this line. The new systems have a better, and more natural, feel-of-the-road, require less manual effort, and have a faster response.

R. A. Pittman and W. A. Van Wicklin, Ford Motor Co., were co-authors of a paper which described the Lincoln gear (AI April 1, 1958). It has a torsion-bar-actuated sliding-spool control valve which acts to decrease the manual steering effort as the output torque increases.

The new Saginaw rotary valve steering gear (AI October 1, 1958), installed on most of the 1959 General Motors' line, was the subject of a paper by P. B. Zeigler, Saginaw Steering Gear Div., GMC. This system likewise uses torsion bar actuation of the control valve, but in combination with a valve of the rotary type. Sensitivity of the new valve arrangement in the 1959 unit is such that it starts to build pressure at only one-quarter of one degree rotation of the steering wheel and builds 1000 psi at about two degrees rotation of the wheel. By comparison, two degrees initially and eight degrees rotation were respectively required with the 1958 gear for equivalent outputs.

A. E. Bishop, Bendix Products Div., Bendix Aviation Corp., was the third main speaker at this session. Mr. Bishop described the Varamatic variable-ratio power steering gear, and suggested its principle as offering advantages in improved maneuverability.

The presentation of these papers invoked considerable discussion. In summary, it looks as though powered variable-ratio gears, with a slow ratio in the center and a faster ratio at the ends, may be the next move. At present there are differences of opinion as to the most desirable ratio combinations, and particularly as to the on-center characteristics. It seems to be generally agreed that the driving habits of the public dictate a step-by-step approach to the ultimate fast-end-ratio.

Air Intake Flow: A new approach to the measurement of pulsed engine air flow, called the total-count method, was the subject of a paper co-authored by B. A. Fries, F. J. Davis and D. E. Hull, California Research Corp. It employs a Geiger counter and a radioactive tracer gas, krypton-85. The method was reported to give absolute values with an accuracy of three per cent, without the need for calibration against standard flows or use of restrictions. In other words, it comes very close to measuring actual volume of engine aspiration.

Computer Analysis: Application of a digital computer in analyzing the operating cycle of a V-8 Diesel engine and to the matching of a turbocharger to the exhaust was described in some detail by H. A. Cook, Thompson Products, Inc. He stated, as the result of these studies, that this means of analysis

EXHIBITORS IN SAE ENGINEERING DISPLAY

Aeroquip Corp.
Aluminum Co. of America
American Bosch Arma Corp.,
American Bosch Div.
American Radiator & Standard
Sanitary Corp.,
Detroit Controls Div.
Anchor Coupling Co., Inc.
Armco Steel Corp.
Associated Spring Corp.

Bacharach Ind. Instrument Co.
Battelle Memorial Institute
Bendix Aviation Corp.
Borg-Warner Corp.,
Warner Automotive Div.
Warner Gear Div.
Bostrom Manufacturing Co.

Chelsea Products, Inc.
Cities Service Petroleum, Inc.
Cleveland Graphite Bronze Co.
Committee of Stainless Steel Producers, American Iron & Steel Institute
Continental Motors Corp.

Dana Corp.
Deluxe Products Corp.
Detroit Aluminum & Brass Corp.
Dow Chemical Co.
Dualoc Drive, Inc.

E. I. du Pont de Nemours & Co., Inc.,
Elastomers Div.
Plastics Div.

Eagle-Picher Co.,
Fabricon Products Div.
Electric Auto-Lite Co.
Electro-Mec Associates
Enjay Co., Inc.

Fairchild Engine & Airplane Corp.,
Al-Fin Div.
Fawick Corp.,
Fawick Brake Div.
Flexonics Corp.
Fram Corp.

Garrett Corp.
General Motors Corp.,
Detroit Diesel Engine Div.
General Radiator, Inc.
Gillett & Eaton, Inc.
Grob, Inc.

Heli-Coil Corp.
Hercules Motors Corp.
Heyer Industries, Inc.
Higbie Manufacturing Co.,
Avon Tube Div.
Hoof Products Co.
Hoover Ball & Bearing Co.

Johnson Bronze Co.

Kaiser Aluminum & Chemical Sales, Inc.
Kelsey-Hayes Co.
Kistler Instrument Corp.

Lake Shore, Inc.
Lipe-Rollway Corp.
Lisle Corp.
Lord Manufacturing Co.

Midland Ross Corp.
Monroe Auto Equipment Co.

Olin Mathieson Chemical Corp.,
Metals Div.

Perfect Circle Corp.
Perfex Corp.

Reynolds Metals Co.
Rosan, Inc.
Ross Gear & Tool Co., Inc.

Satullo Co.
Spray Products Corp.
Stratoflex, Inc.
Sun Oil Co.

Thompson Products, Inc.
Torrington Manufacturing Co.
Tyrex Inc.

Vance & Villani
Vickers Inc.

Waukesha Motor Co.
Jervis B. Webb Co.
Wyman-Gordon Co.

Zollner Corp.

promises to "advance the art of new engine design" in making possible "clearer insights into engine test results and development problems," with savings in development time and in cost of experimentation.

Tape Control: Magnetic tape has been newly applied in the laboratory for controlling cycling of test equipment. The particular application in question concerned studies on the warm-up characteristics of gasoline in passenger car engines. It was described in a paper by K. A. Frassa and C. R. Small, Socony Mobil Oil Co. Basically, the new system of instrumentation utilizes magnetic tape to automatically program the test cycle. It is combined with a strip chart recorder which traces engine performance and choke position under repeated accelerations from cold start to warm-up point.

Fuel Distribution: Radioactive tracers have also been used for studying the fuel distribution in individual cylinders of two V-8 test engines. Report on the technique and findings was contained in a paper by D. E. Cooper, R. L. Courtney and C. A. Hall, Ethyl Corp. Fuel components were "tagged" with tritium or Carbon-14 and then blended with commercial fuel. Their distribution to individual cylinders was determined by measurements of exhaust-gas radioactivity, using an analyzer of the catalytic-cell type. One of the important findings was that distribution was more affected by position of throttle plates than by any other operating variable. In one engine, shifting of the throttle-plate axes 90 deg in the horizontal plane produced sizable improvements in power and fuel economy, as well as in the anti-knock characteristics of the engine.

Carburetor Icing: Evaluations in the laboratory of the effect of fuel characteristics on carburetor icing were reported by D. P. Barnard V and E. H. Scott, Standard Oil Co. (Ohio). They found that the full ASTM distillation range has an influence on icing tendencies. They also "discovered" additive synergism (combined action). Compounds when used individually showed no significant anti-icing benefits, but when combined with others demonstrated "remarkable effectiveness." The theory is that one of the compounds acts as a plasticizer for the other.

Spline Standard: Various aspects of the new SAE Standard for "Involute Splines, Serrations and Inspection" received attention in one of the sessions. It was analyzed from the design, manufacturing, and gaging standpoints by three speakers—L. N. DeVos, Ford Motor Co.; G. H. Sanborn, Fellows Gear Shaper Co., and A. S. Beam, Vinco Corp.

As a supplement to the foregoing, extracts from a number of the papers given at the meeting are presented as follows:

How Can Aluminum Best Be Used To Improve Today's Brakes?

By R. L. Atkin and F. J. Weber

Kelsey-Hayes Co.

With the success encountered in developing aluminum brake drums which gave exceptional performance free from brake noise or roughness under severe braking conditions, it was decided to further extend the use of aluminum to determine the "point of diminishing return" in terms of brake performance.

Theoretically, by obtaining more aluminum heat radiating area and more air flow across this area, we would anticipate further improvement in braking performance. To achieve this we designed an assembly which not only had a heat radiating surface on the outer periphery of the drum ring, but also extended it into the area normally occupied by the drum back and the disk or spider of the standard passenger wheel as shown in Fig. 1. This design not only offered the ultimate in exposure to the air stream but also provided an open air path completely across the drum.

The large mass of aluminum also served as a reservoir for high heat input brake stops.

Metallurgically bonded liners were incorporated into the integral design because of the good heat transfer characteristics, the brake smoothness, and the noiseless brake operation we had experienced on previous aluminum brake drums. Also, since the drum back in the integral hub and drum assembly serves as a structural

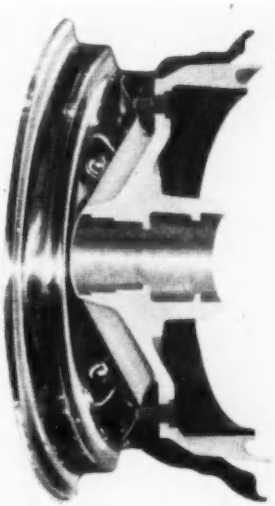


Fig. 1—Integral hub and drum assembly

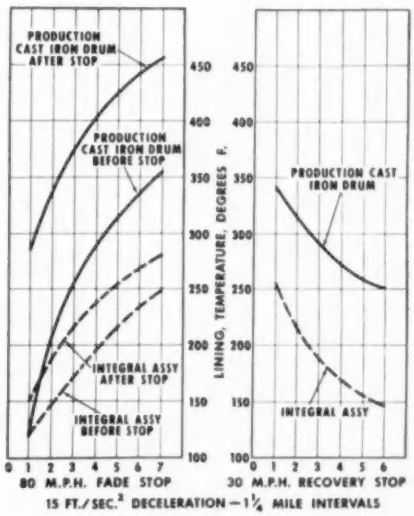


Fig. 2—Relative performance in car test operation of production cast iron drum and integral hub and drum assembly

portion of the wheel, high purity A356 aluminum having high elongation was specified.

Prototypes of the design shown were tested on our rotating fatigue and rim test machines to compare the integral design fatigue life and strength with that of the standard production steel wheel. Initial test results were very good except for loosening of the bearing cups in the aluminum castings. Our stress laboratory conducted strain gage checks which showed that additional aluminum thickness was required in the hub barrel area in order that combined assembly and load stresses remained below the yield strength of the section. After this material was added further wheel tests were satisfactory.

Following laboratory fatigue and stress analysis tests, we began car tests on the integral hub and drum assemblies. Results were immediately most encouraging. Numerous tests under a variety of test conditions all showed the superior performance of the integral construction. Figure 2 illustrates the comparative performance of the integral design under a few of the conditions evaluated.

Our tests on the integral hub and drum assemblies have also shown that, because of the lower brake lining temperatures, brake stability is much improved. Wear tests also indicate that we may expect substantially greater lining life because of the lower temperatures. Apparently because of the dampening features of the construction, no brake noise has been experienced in any of our testing to date.

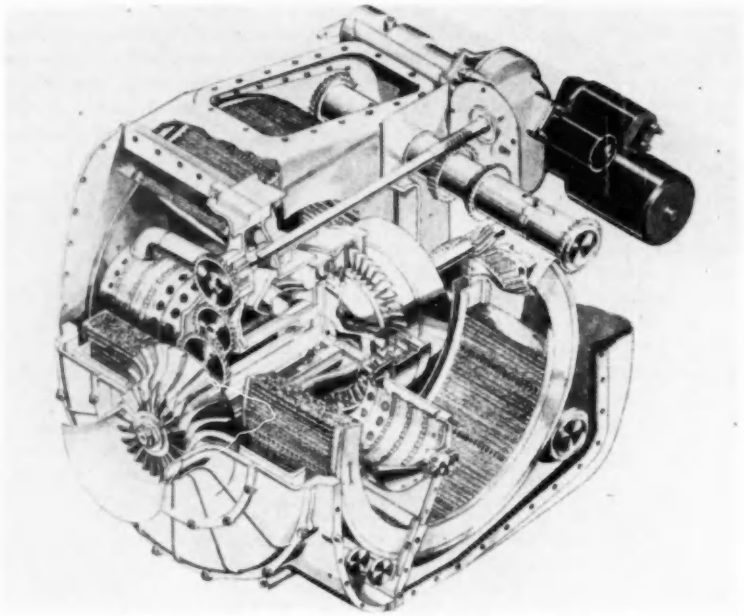


Fig. 1—Cutaway view of GT-305 Whirlfire engine

The GT-305 Regenerative Engine in Firebird III

By W. A. Turunen and J. S. Collman

General Motors Research Laboratories

An entirely new regenerative gas turbine engine powers the Firebird III. This engine, called the GT-305 Whirlfire, is one of the principal features of the advanced engineering concepts embodied in this revolutionary vehicle. Engineering advances in turbine design have been incorporated with many proven features from its predecessor, the GT-304, which powered the Firebird II, to give the GT-305 engine new levels of attainment for regenerative gas turbines in horsepower per pound of fuel and horsepower per pound of engine weight. These advances, coupled with more compactness and greater rigidity, make the GT-305 engine a new milestone in the development of vehicular gas turbines.

The GT-302 used to power the Firebird I had a specific fuel consumption of 1.63 lb/hp-hr. Two years later the GT-304 in the Firebird II used only 0.77 lb of fuel per hp-hr. The principal reason for this gain was the addition of regeneration to the cycle to recover heat from the turbine exhaust. The GT-305 engine has been

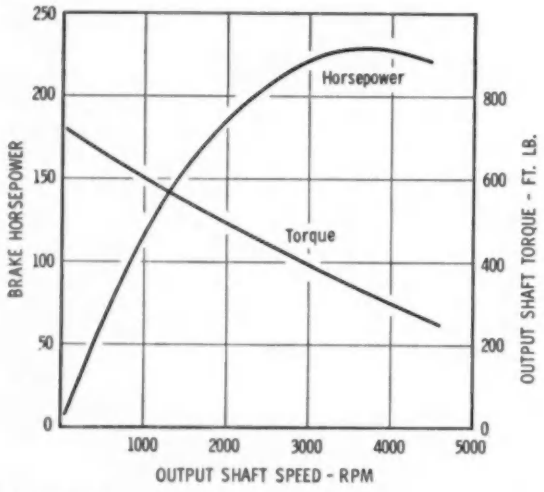
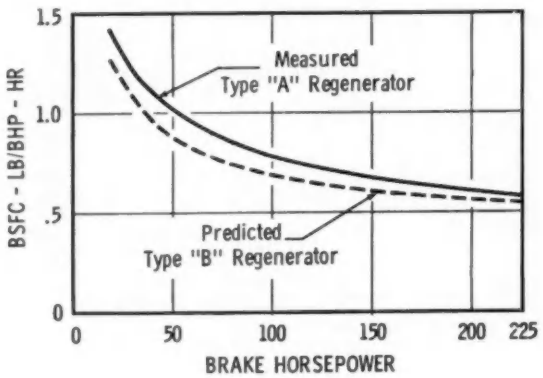


Fig. 2—GT-305 test performance—torque and horsepower

Fig. 3—GT-305 performance — brake specific fuel consumption



designed to attain a specific fuel consumption of 0.55 lb/hp-hr. Here the gain has been accomplished by improvements in all components and is the result of extensive component testing.

The design of the GT-305 engine effectively integrates the components into a clean compact unit. Figure 1 shows a perspective cutaway view of the engine assembly. The two turbines are arranged on a common horizontal axis. Designed for an inlet temperature of 1650 F, the first stage turbine turns the radial flow compressor at 33,000 rpm through the connecting shaft. The second stage or power turbine turbine, immediately behind the first but mechanically separate, drives the output shaft through a single stage helical reduction gear. The power turbine develops full power at 24,000 rpm, which is reduced to 3500 rpm at the output flange. A speed limiting governor permits the output shaft to turn as high as 4500 rpm to take advantage of the flat characteristic of the gas turbine horsepower curve.

The two drum shaped regenerators are located on either side of the turbine shaft just behind the compressor casing. A bulkhead extending from top to bottom of the casing combines with side covers to form a high pressure plenum chamber. The casings to the rear of the bulkhead form a low pressure exhaust plenum. Each regenerator passes through the bulkhead so that about one third of its circumference is in the high pressure plenum and the remaining two thirds is in the exhaust plenum. The combustors are located in the high pressure plenum between the regenerators and the bulkhead. The turbines are located within the passage between the high and low pressure plenums.

Dynamometer evaluation of the GT-305 engine has been even more encouraging than vehicle tests. Results of actual engine operation are plotted in Figs. 2 and 3. The maximum power slightly exceeds the design point of 225 hp. The ratio of stall to full power torque is about 2.25 to 1. A bsfc of 0.59 lb/hp-hr has been measured with the type A regenerators. The type B regenerators now being tested on the component rig will reduce the bsfc all along the line as shown in Fig. 3. These new regenerators will equal or improve upon the design bsfc of 0.55 lb/hp-hr.

A New Concept of Light Weight Highway Tractor Design

By C. V. Crockett and D. J. LaBelle

GMC Truck and Coach Div., General Motors Corp.

Air suspension permits the addition of a brake regulating valve which automatically divides the braking effort between the front and rear wheels in proportion to the load on the wheels.

When fully loaded, the weight on the rear wheels is 18,000 lb and the load on the front wheels is 11,000 lb. With no trailer, however, the loads become 7200 lb front and 3000 lb rear. A braking effort proportioned to the loaded condition will slide the rear wheels and provide only about one-sixth normal deceleration when the tractor is driven without trailer. A lightly loaded trailer provides loads intermediate between these two extremes. No fixed division of braking effort between front and rear suspensions can provide optimum braking under more than one condition.

With air suspension, however, the leveling valves always maintain normal standing height regardless of load and they do this by increasing the pressure within the bellows as the load increases. The air pressure within the bellows thus varies in exact proportion with the load. A device, therefore, which will regulate the air pressure used for braking in proportion to the pressure within the bellows would give division of braking effort front and rear in proportion to the static load. Figure 1 charts the relationship between the air pressure within the rear bellows and the maximum air pressure available for the rear brakes. Figure 2 shows a section through the regulating valve; the rear bellows air pressure is in the chamber on the right side of the diaphragm. When the brakes are applied, the air which applies the rear brakes enters the chamber on the left of the diaphragm. When the brake air pressure approaches the proportion established by the areas and the spring, the valve closes, limiting the brake air pressure to the value shown by the chart.

In addition to the change in front and rear wheel loading due to the amount of trailer load, there is a transient shift of weight from the tractor rear axle to the front axle during brake deceleration. The regulating valve corrects for this condition the same as it does for the static loading, excepting however, that because the air spring effective area changes with spring deflection the resulting transient air pressure in the bellows is not in exact proportion to the transient load on the wheels. It gives an approximation, however, which brings the tractor braking effectiveness into the pleasure car area under all loading and braking conditions. (*Turn to page 38, please*)

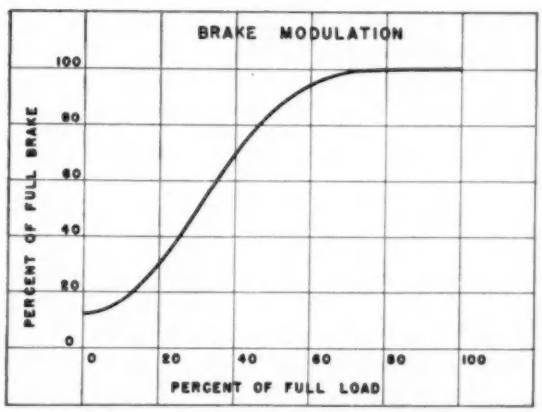
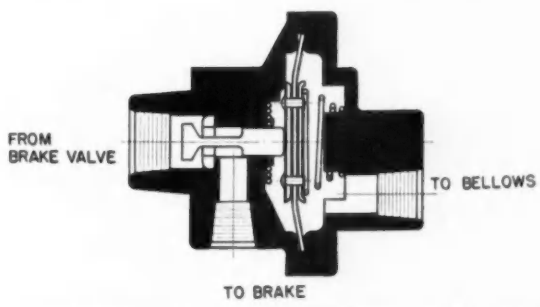
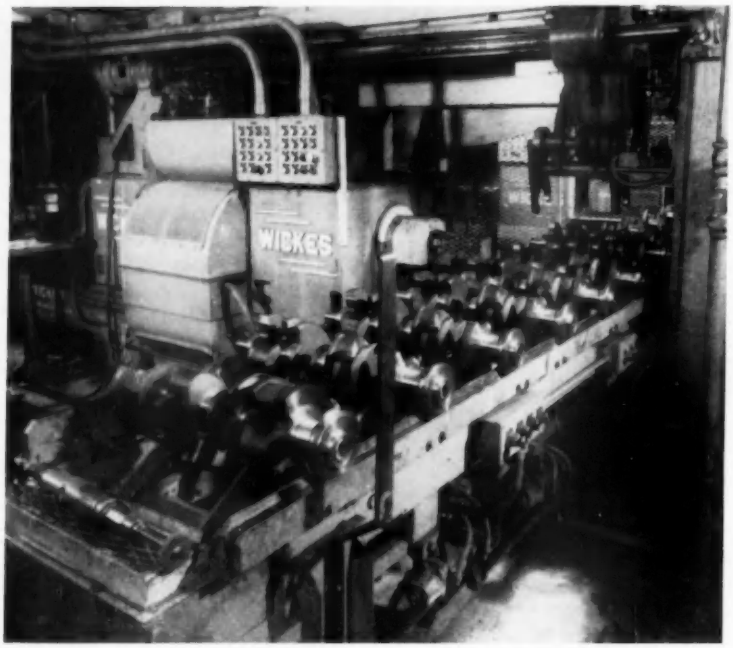


Fig. 1—Relationship between air pressure within rear air suspension bellows and maximum air pressure available for rear brakes

Fig. 2— Regulating valve





First station of the four-unit Wickes crankpin turning machine with guards removed. Positoiner in background is in readiness to pick up a shaft from the conveyor and to load a machined shaft on the same conveyor from the arm in the rear.

Armasteel Cast Crankshafts Machined on Automatic Lathes

By Joseph Geschelin

THE four crankpins of the Armasteel cast crankshaft for the 1959 Pontiac engine are turned in a battery of Wickes automatic lathes, probably the first installation of its kind in the industry. Both counterweight cheeks and crankpins are machined in a single setting in each machine.

The battery consists of four automatic lathes, tied into a single line by means of Wilson Automation. Each lathe turns one pin station and cheeks, completing the four pin stations in a unified automatic cycle. Crankshafts are delivered to the first station on a feeder conveyor where operators place them on the Wilson conveyor.

Each of the machines features a massive positioner which serves the function of a transfer mechanism as well.

At any given time the positioner moves over the conveyor, picks up a crankshaft and at the same time deposits a machined crankshaft on the conveyor. Then it traverses over to the machining station, dips in to unload a machined shaft, and immediately loads the other shaft, locating on ground main bearings. The same procedure takes place in each of the four machines in the line.

Looking at the machining station, it is of interest that each one has been provided with five Carboloy tools, three for the front slide, two for the rear slide. One of the major features of the lathe equipment is that the mechanism is sufficiently rugged and the drive mechanism endowed with the capability of providing the feeds and speeds required for optimum c-t-c tool cutting. Thus it becomes feasible to realize maximum productivity as well as best tool life in machining the pearlitic malleable material.

Currently Pontiac is experimenting with a variety of solid carbide tools to find the grade best suited for this operation. At the time this article was prepared, Pontiac was running the lathes at approximately 400 rpm for turning the pins, and at around 170 rpm for cheeking. The lathe is equipped with a variable speed d-c motor which automatically adjusts for the speed change, starting with 170 rpm and stepping up to 400 rpm for the smaller diameter. Final values of speeds and feeds will depend upon the choice of tools later on.

The turning operation not only takes into account the change in cutting speeds, mentioned above, but also variations in the amount of metal removal. For example, it is necessary to remove about 3/32-in. of metal from the cheeks and about ⅛-in. from the pin. However, much more metal is removed at the junction of the cheek and pin where there is a heavy casting fillet.

While experimenting with different grades of carbide tooling, the engineers also are contemplating changes in the design of the positioners to improve cycle efficiency. It is anticipated that the equipment as finally tuned should have a maximum capacity of 55 to 60 pieces an hour from the line, for a net output of around 400 shafts per day.

According to the management, the major advantage of this equipment is the ease with which it can be retooled to accommodate changes in crankshafts from year to year. The new tooling is relatively inexpensive and the change can be made in a matter of a few days. Consequently, the method not only is flexible, but it gives the designers ample opportunity to make changes in crankshaft stroke without the penalty of high tooling cost. ■

Design and Operation of the Ford Limited-Slip Differential

In the announcement of the 1959 Ford line (see AI, October 15, 1958) brief reference was made to the salient features of the so-called "Limited-Slip" differential which is offered as optional equipment. It may be noted that the unit was designed in the axle engineering group of the company's Transmission and Chassis Division and is manufactured at the Sterling plant, north of Detroit.

In operation, the differential is locked at all times until slipping action is required. This is accomplished through a single, constantly preloaded clutch, set to slip at torque values between 315 and 385 lb-ft.

Looking at the sectional drawing it will be seen that a hardened steel member (1) on the left is interposed between the side gear and the differential case half. The periphery of this part is serrated to drive two of the stack of five purchased clutch plates. This includes three steel plates (2) sandwiching two sintered friction plates (3). All five plates are of the same size and differ only in slight detail from similar plates used in Ford automatic transmissions. Preloading of the clutch element is achieved through the action of two heavy Belleville springs (4) which contact against the inner face of the left case half.

When the two halves of the case are fastened together at assembly the preload is obtained automatically, locking the gear train. A special rear axle lubricant is required for proper lubrication of the optional differential. To assure constant lubrication, a special baffle (4) is employed to direct oil to the clutch plates.

The right hand case half is the same as the production part except that the usual pilot at the inner cavity is machined off. The left case half (7) is different in configuration and is extended at the outer diameter to provide a pilot at the periphery of the right case half.

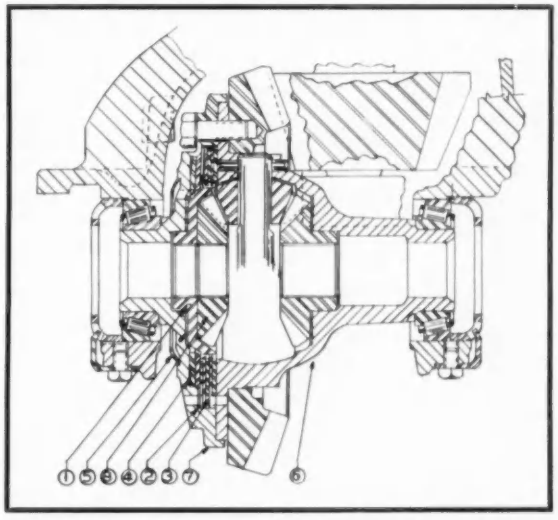
Standard production differential gear sets are used with but one minor exception. When required for the optional differential, the left side gear (8) has the hub machined off after completing the standard gear, just before heat treatment.

Wear, which is anticipated in any heavily loaded mechanism, is counteracted during the normal life of the rear axle by the action of the Belleville springs. Unless unusual wear occurs the clutch will behave normally at all times.

The remaining problem is one of producing assemblies in such fashion that the unit is preloaded to the required limits in regular production without resorting to selective assembly. In the case of individual components, as well as vendor furnished clutch plates and

(*Turn to page* 64, *please*)

Special hydraulic testing machine built for Ford for checking the torque capacity of the clutch system of the limited-slip differential



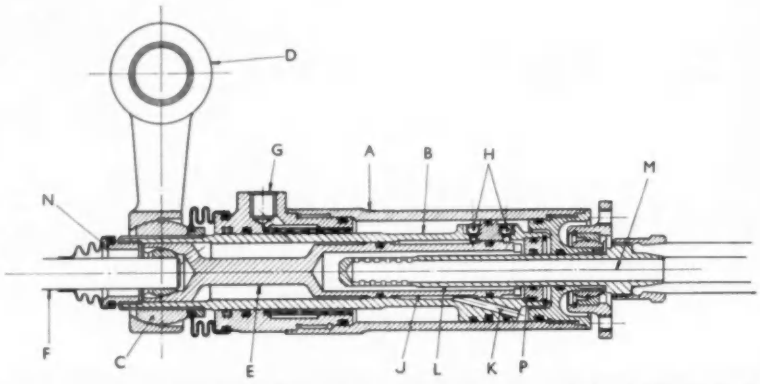
Cross-section of the 1959 Ford differential and carrier, showing details of the limited-slip differential which is available as optional equipment

Operation of Turner Leduc Power Steering Unit

A SERVO-STEERING unit for commercial vehicles, based on the Leduc aircraft control, is now being produced in Britain by the Turner Manufacturing Co. The main components are a cylinder attached at one end to the chassis frame, a differential servo piston ball-jointed to an idler arm or track rod, and a coaxial control piston flexibly linked to the steering drop arm.

Referring to the section drawing, the effective area of the right-hand side of the piston is twice that of the left so that equilibrium is established when oil pressure on the two sides are inversely proportional to their respective piston areas. In this balanced state, ball valves H are closed by the applied pressures.

When control piston E is moved to the left, a ramp on its extremity unseats the left-hand ball valve, releasing high-pressure oil to flow through annular space J and passage K to the low-pressure side of the piston. The servo piston then follows the control piston to the left until movement of the latter is stopped, when the valve closes and the pressure balance is restored.



Turner Power Steering Servo Type P.A. 100 for Commercial Vehicles

A Servo Cylinder
B Differential Servo Piston
C Ball Joint
D Steering Arm
E Control Piston
F Control Rod
G Oil Entry
H Ball Valves
J Annular Space
K Connecting Passage In Servo Piston
L Hollow Part of Control Piston
M Oil Exhaust
N Ring Nut
P Piston Cover

If the hollow control piston is pushed to the right, the other valve is wedged open, and oil drains through it and space L to exhaust pipe M and back to the reservoir. Loss of pressure causes movement to the right, which continues as long as the valve is held open.

Since oil flow requirements are very small, the servo will continue to function on an accumulator for some time in the event of pump failure. In the case of complete hydraulic breakdown the unit provides emergency mechanical steering, for the travel of the control rod and piston is limited by ring nut N and end cover P. As this power steering system is non-reactive, artificial "feel" can be obtained by hydraulic and mechanical resistance attachments. ■

Annual Meeting of the SAE

(*Continued from page* 35)

Multiple Shoe Brakes for Higher Torque

By P. A. Smith and P. F. Black
B. F. Goodrich Aviation Products

THE B. F. Goodrich Co. is now producing the multiple shoe "Hi-Torque" brake (Fig. 1). To make effective use of all lining contact and to eliminate pressure peaks or variations, the length of each block approximates its width. Each lining is confined from axial movement by side frames and from rotational movement by torque bars. Extending through the side frames and the lining is a leaf spring applying a force to the linings toward the center of the brake, assuring positive retraction upon release of the brake. The brake actuation is, in effect, a flexible hydraulic platform providing complete freedom for lining contact.

The torque developed by each lining is opposed by torque bars welded into the side frames. These torque bars and lining elements are evenly distributed about the 360 deg of brake circumference. The actuation is by a full-circle, hydraulic expander tube made of fabric-reinforced neoprene. This tube imparts direct and equal pressure to all linings.

As the linings are not continuous at the torque bar locations, a steel shoe is riveted to the lining base. In addition to supporting the expander tube, the shoe provides the base for the force of the retracting springs. Thin steel shields bridge the separation between the steel shoes to keep the tube from extruding after ex-

British Driverless Tractor

Driverless tractor developed by the University of Reading, England

A DRIVERLESS farm tractor, developed in Britain by the University of Reading, is intended for routine carting in areas where labor is unskilled or scarce, and for transporting radioactive materials or toxic weedkillers. Controlled by induction coils sensing a wire laid along the ground or just beneath the surface, it can follow a fixed route through the farmyard and fields, stop at animal feeding points and unload fodder, obey normal traffic signals, and sound its horn when required.

The basic signal radiated by the wire is a continuous 1000-cycle tone from a one-watt audio oscillator. Steering is regulated by a pair of induction coils on an arm extending forward from the track rod. Spaced a few inches above and normally straddling the wire, they detect the signal which is amplified in separate transistor circuits. The parallel outputs are fed into a two-way relay that actuates one of the two solenoid valves on the electro-hydraulic steering servo.

When the tractor veers off course, reception in the coils becomes unbalanced. The stronger signal then overrides the weaker one, and steering is corrected to compensate.

Auxiliary pick-up coils on either side of the tractor, energized by hairpin loops at desired places along the wire, control the clutch, pto, horn or other equipment through similar servo mechanisms. The clutch is operated by a double-acting ram with a time-delay preset for the required stopping interval.

As a safety feature, the clutch is also controlled by the telescopic front bumper. This has an 18-in. travel, and closes the disengagement circuit if the tractor accidentally strikes anything. In addition, a third "no-signal" search coil between the two steering pick-ups stops the machine should it wander too far off course, or in the event of signal failure.

Although the system is still in its early development stage, the University of Reading regards it as the start of farm automation and suitable even for row-crop cultivation. Experiments are now being conducted with an International Harvester B-250, but the University is planning to adapt the equipment for a tractor with hydrostatic transmission whose single-lever control would enable one hydraulic ram to regulate speed, direction and braking. ■

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tended service. The expander tube is supported on the inside by the cast torque plate.

When pressure is introduced into the expander tube, the linings move out radically to contact the drum with equal pressure because all activitation is from one hydraulic chamber. At no point in the brake drum does the lining pressure ever exceed the brake pressure. By controlling the amount of fluid leaving the brake, retraction of the lining is controlled. By this means brake adjustment or lining clearance is maintained.

As uniform pressure is exerted around the entire brake and self-energization is eliminated, uniform torque will be developed around the entire brake and dispersed evenly through the frames and torque plate.

The system for actuating the B. F. Goodrich Hi-Torque brake should be able to deliver up to 22 cu in. of hydraulic fluid at pressures up to a maximum of 700 psi, depending upon the torque required. The volume requirement varies with the size of the brake, the 17¼ by 4-in. size requiring approximately seven cubic inches. There should be enough reserve capacity to take care of thermal expansion of the drum. The system requires control valves to enable the operator to meter the fluid to the brakes.

When equipment is converted to use the Hi-Torque brakes, the actuation system is normally used without changing the control system. ■

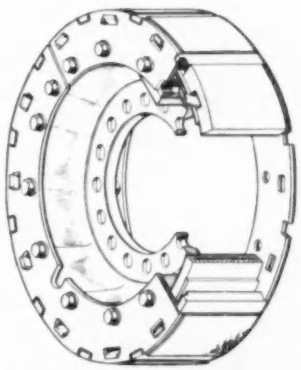
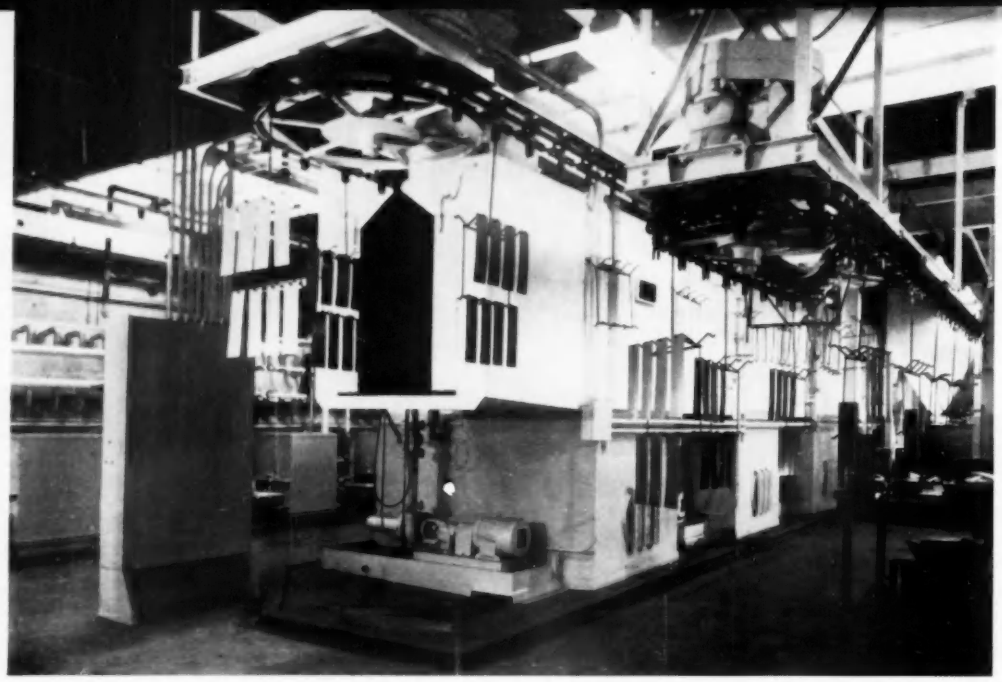
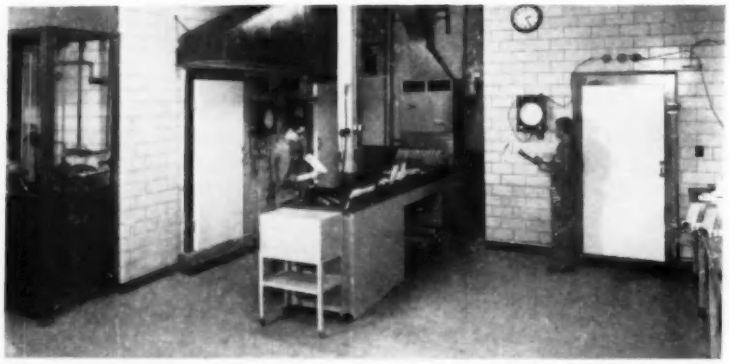


Fig. 1—B. F. Goodrich Hi-Torque multiple-shoe brake



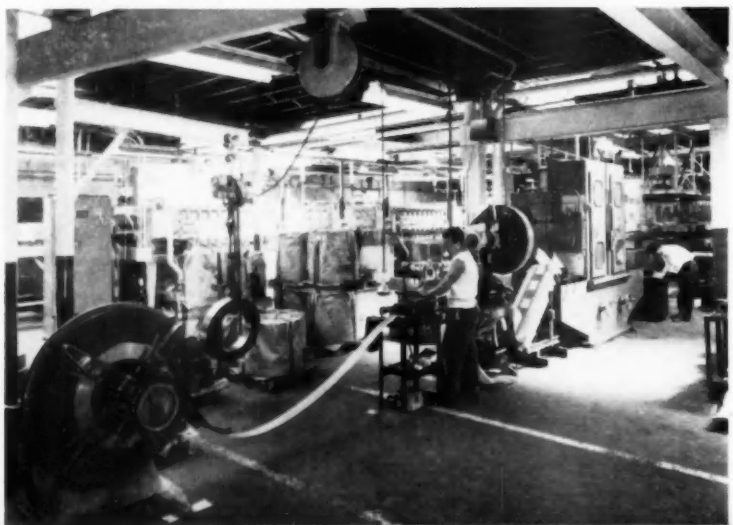
Conveyorized automatic Spra Bonderite unit in Parker's production line

Automated Production Line For Paint Test Panels



In these accelerated test rooms in the Parker Technical Service Department, panels from each day's production are given salt spray and humidity tests

Panels are stamped from coil stock, scrubbed, straightened, punched, and flat polished automatically in the installation seen below



EQUIPMENT now in operation at the Parker Rust Proof Co. for the production of paint test panels includes an automatic press for stamping and punching, an organic solvent scrubber, a two-stage flat polisher, a multi-stage automatic conveyorized Spra Bonderite phosphate coating unit, and a dry off oven. These units are placed to form a modern, high speed, automated production line for efficient and uniform preparation of test panels.

To insure quality, eight quality checks are made in each day's production at regular intervals. As the panels emerge from the polisher, they are checked for flatness. Profilometer readings are taken to hold the surface finish at 15 to 18 micro-inches. Panels, selected at random from the line, are checked for coating weight. Other panels are painted with a standard commercial finish and tested in salt water and humidity. Painted panels are also given impact, conical mandrel, and adhesion tests.

The automatic spray equipment can be controlled for time, temperature, conveyor speed and dry-off temperature as required by the phosphate coating which is being applied. ■

Observations

By Joseph Geschelin

Clean Glass

Now that the rear window is wraparound and just about as large as the windshield it appears to us that it is time for a rear window wiper installation. It should be standard equipment but certainly an accessory item. There is a definite need for this on the slanted window glass since an unobstructed rear view is just as important as the view in front. Equipment of this kind was offered in the past but was not too satisfactory due to plumbing problems. Today it is a simpler matter to employ an electric mechanism located right at the rear.

Fuel Injection

We mentioned recently the virtual disappearance of fuel injection on 1959 models. Wisely, we believe, the various manufacturers have decided to clean up problems of performance and cost with a fresh look at cost before embarking on another promotional campaign. One of the major companies concerned with this development tells us they will have a good system at a price some time in the near future. During SAE week in Detroit we observed an interesting new slant. One of the manufacturers is now grooming a rather simple device — entirely mechanical — for solid fuel injection exclusively for truck and marine engines. This is something well worth watching, although no public announcement will be issued until the end of 1959.

Galvanized Sheet

Problems of corrosion still are with us not only in exhaust systems but in the autobody as well. We learned recently that considerable work has been underway for some time in the utilization of galvanized sheet for underbodies. This is said to assure freedom from corrosion indefinitely without resorting to special operations such as immersion of the body shell. Galvanized strip, too, has had signal success in extending the life of mufflers.

Heavy-Duty Transmissions

We hear that Fuller has been making an intensive drive on the development of special heavy duty transmissions tailored specifically for the requirements of off-highway vehicles. These are strictly heavy duty, massive gear boxes aimed at taking the gaff of construction and mining operations without failure and without premature wearing-out.

Advanced Brakes

Fawick Brake Div. was in there pitching with a showing of its Girling brake line at the SAE Annual Meeting. In addition, Fawick had an interesting new development—the Girling Towing Stabilizer. This is a simple attachment for towing all manner of trailers without tendency to sway or get out of line. It includes a hydraulic damping device consisting of two, angulary mounted shock absorbers.

Aluminum Future

Alcoa's new vice-president, "Fritz" Close, was in Detroit recently, predicted to a group of newsmen that the use of aluminum in motor vehicles will climb fantastically during the next five years. He observed that aluminum has a unique place in the metal picture since it is the only metal that can be fabricated by means of every known technique—sand casting, die-casting, permanent mold casting, forging, extrusion, powder, stamping, etc. Moreover, it can be finished satisfactorily by any known technique. Aluminum is truly an extremely versatile material, we learned.

Value Analysis

In view of the interest in this subject we suggest a reading of the paper—General Electric's Approach to Value Analysis, by N. E. Kewley, presented at the recent SAE Annual Meeting. The author explains that value analysis must not be confused with cost reduction. It is an aid to cost reduction because of an organized step-by-step analysis of a problem. Value analysis is difficult to define in a simple sentence. The author boils it down to "let's carve out the functionless fat." His definition of the term "value" in the equation is—the lowest price you must pay for the desired function or service, at the time, place and with the essential quality. In short, value analysis is a determined search by trained and thinking people to seek out the places where unnecessary frills or costs can be eliminated in the product design or in its manufacture without affecting quality.

Idiot Proof

Reliability has become so vitally important in aircraft and missile manufacturing that a new scale of human capabilities has been evolved. The concept of "foolproof" which still holds in motor car manufacture, no longer has meaning in the more sophisticated fields of aircraft and missiles. The demand now is for design that is "idiot-proof."

METALS

Steel Operating Rate in First Quarter Expected To Be Moderately Higher than in Last Quarter of '58

By William F. Boericke

Steel Capacity Increased to 147.6 Million Tons

As the new official figure for steel capacity is now 147.6 million tons a year compared with the 140.7 million ton 1958 figure, or a five per cent increase, a comparison with last year's operating rate may be misleading. Thus in mid-January output was up to a 2.1 million ton weekly rate, compared with barely 2 million tons when the year closed. Based on the new capacity, operations were about 74.5 per cent. If the 1958 figure had been employed, the rate would have been over 78 per cent.

Iron Age reports the market is tightening up, with largest demand for cold rolled sheets and galvanized products. Some of the galvanizers have their order books full for the next two or three months, and new customers can't be assured of delivery in advance of that time. Demand for plates is picking up, with special insistance on plates for making large diameter line pipe. However, the call is stronger from the mid-west than from the Atlantic coast. Business in wire products still leaves a lot to be desired due to foreign competition. Bars and structurals are readily available. Sales of tin and terne plate are good.

Operating Rate Expected to Reach 80 Per Cent

It is expected that first quarter operations will be moderately higher than the fourth quarter of last year, but the increase will not be great. The operating rate may reach 80 per cent in April, perhaps higher, if consumers start to stock up in anticipation of a summer walkout by the steel workers. However, thus far there appears to be little hedge buying and the buildup in inventories is slow. Steel makers are reluctant to blow in more furnaces until orders are on the books to justify doing so. Consumer stocks are estimated about 14 million tons, or just about the same as last September. This represents a cut of some 50 per cent from early 1958. Consumers are convinced there will be plenty of steel available because of the large surpius of production facilities over present operating rate. The weak point of this argument is that while there can be plenty of raw steel produced, finished steel is something else and a rush to build up inventories before a strike was called could result in real stringency for late buyers.

The automobile makers are steel's biggest customer, but they are not crowding the steel mills with orders thus far. If car sales spurt as spring approaches, this situation could change quickly and there is a good chance it will. But at present Detroit wants more conviction on public reception of the new cars before raising their sights for steel requirements.

Shipments of Iron Ore to Increase

There is better news for the iron miners who experienced one of their worst years in 1958. Only 53 million tons of ore were shipped down the Great Lakes last year, but with steel production improving, ore producers have returned to a five-day week at the mines and it is thought the lake movements may reach 70 million tons in 1959. Larger shipments are expected as well from Canada with the opening of the Seaway.

Normal Nickel Production Resumed After Strike Ends

End of the three months strike at the International Nickel mines in Canada brought announcement by the world's leading producer it would step up production 20 per cent over the pre-strike level. About 24,000 tons of both copper and nickel had been lost by the long work stoppage. Because the plants had been adequately maintained during the strike period, there was less delay in returning to normal operations and early in January output had reached a normal 9600 tons a month rate, still somewhat less than full capacity.

Under the strike settlement terms small wage increases were granted that increase over the next two years. The company announced it would not increase the basic price for nickel to compensate for higher wage costs. This would appear to insure no change in the present 74 cent per pound price over the near term. As the company had large inventories of nickel prior to the strike, normal deliveries to customers were maintained, and it is reported ample stocks are still on hand, although all its copper has been disposed of.

A company official asserts that vigorous competition prevails in the nickel industry and every effort must be made to recapture markets lost in 1956-7 because of short supplies and to find new ones. Consumption of nickel in 1958 totaled about 160,000 tons in the Free World, against 207,000 tons in 1957. Most of the loss occurred in the U. S. and Canada. In Europe and in the United Kingdom demand held up quite well. It is reported that Russia has been buying in the open market, to supplement its own production of about 50,000 tons a year.

(*Turn to page* 66, *please*)

Report from the

FARM EQUIPMENT INDUSTRY

By Kenneth Rose

The 1958 Record

The fact that production of farm machinery and equipment showed a "distinct upward trend" through 1958 is confirmed by the annual industry report of the U. S. Department of Commerce.

Farm machinery production in 1958 amounted to roughly $1.9 billion, an increase of approximately 15 per cent over 1957. It reflected, in part, the highest income for farmers in the past five years and an income of about 10 per cent above 1957. Another key factor was the replacement requirements for farm machinery, which increased in 1958 — and should increase further in the next few years.

Production of the new 1959 Gleaner-Baldwin combine is now under way at the Independence, Mo., works of Allis-Chalmers

John Deere has developed the attachment shown here for clearing stones from farm land, and used in conjunction with the company's potato digger and tractor, also shown

Outlook for 1959

It is predicted that 1959 gross income of farmers will be down slightly (about two per cent) from 1958, with net income 5 to 10 per cent below 1958. On the other hand, it is likely the machinery replacement factor will become increasingly important in 1959. Large purchases were made during the period 1946 through 1952, much of which are now due for replacement. Improved technology should also hasten replacement. This is thought to be particularly true in the area of tractors and heavy harvesting machinery.

The manufacturers feel there will be a modest increase in the sale of farm machinery and equipment during 1959—possibly somewhere in the neighborhood of 5 to 10 per cent above that of 1958.

New Equipment

In anticipation of a good sales year, manufacturers of agricultural equipment have brought through new machines that have higher speed, greater capacity, or improved labor-saving features.

Allis-Chalmers has started production on its Models A and R Gleaner-Baldwin self-propelled combines at the company's Independence, Mo., works. Features of these models are a new quick-detachable header, held in place by hook-type latches in mating slots, and with spring-loaded wedge pins forming a self-tightening lock. Both the standard grain header and the two-row corn head

(*Turn to page 73, please*)

• • INDUSTRY STATISTICS • •

WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	Weeks Ending Jan. 17	Weeks Ending Jan. 10	Year to Date 1959	Year to Date 1958
PASSENGER CAR PRODUCTION				
Total—American Motors Corp.	8,449	6,983	18,083	9,031
Chrysler	1,627	1,706	3,668	4,685
De Soto	1,426	1,343	3,036	1,720
Dodge	4,260	4,198	9,300	5,039
Imperial	467	472	1,035	1,533
Plymouth	10,703	10,795	23,601	24,939
Total—Chrysler Corp.	18,483	18,514	40,640	37,916
Edsel	1,400	1,400	3,080	1,014
Ford	31,685	30,227	68,964	65,024
Lincoln	879	855	2,019	1,429
Mercury	4,253	4,189	9,276	8,071
Total—Ford Motor Co.	38,217	36,681	83,339	75,538
Buick	8,909	8,994	19,684	22,891
Cadillac	3,807	3,809	8,968	7,081
Chevrolet	36,148	36,084	79,404	81,969
Oldsmobile	9,918	9,790	21,731	23,157
Pontiac	9,068	8,738	19,529	18,762
Total—General Motors Corp.	67,850	67,415	149,316	153,860
Total—Studebaker-Packard Corp.	2,936	3,772	7,842	1,157*
TRUCK AND BUS PRODUCTION				
Checker Cab	154	81	235	80
Total—Passenger Cars	136,089	133,446	299,455	277,582
* Includes Packard.				
Chevrolet	8,493	8,707	18,837	14,360
G. M. C.	1,805	2,076	4,214	3,048
Diamond T	141	116	257	261
Divco	70	70	154	144
Dodge and Fargo	1,780	1,858	3,638	2,069
Ford	6,857	6,426	14,746	12,927
F. W. D.	20	13	33	89
International				6,377
Mack	360	339	699	473
Studebaker	297	211	569	128
White	346	406	752	967
Willys	2,356	2,288	4,644	3,834
Other Trucks	50	50	110	146
Total—Trucks	22,575	22,560	48,653	44,843
Buses	45	45	100	181
Total—Motor Vehicles	158,709	156,051	348,208	322,606

1958 TRUCK TRAILER SHIPMENTS

Industry Division, Bureau of the Census

Type of Trailer	November	Eleven Months 1958	Eleven Months 1957
Vans			
Insulated and refrigerated	316	3,169	4,208
Steel	36	322	578
Aluminum	280	2,847	3,630
Semi-insulated	33	490	623
Steel	33	490	110
Aluminum			513
Furniture	89	1,380	1,490
Steel	82	1,380	1,490
Aluminum	7		
All other closed top	1,834	15,870	19,505
Steel	687	5,283	8,712
Aluminum	1,147	10,587	10,793
Open-top	252	2,131	3,005
Steel	70	944	1,489
Aluminum	182	1,962	1,516
Total—Vans	2,524	23,040	28,831
Tanks			
Non- and low pressure			
Petroleum			
Carbon and alloy steel	194	2,110	
Stainless steel	14	202	
Aluminum	119	1,292	
Total—Petroleum	327	3,607	4,374
Chemical, food, fluid solids	38	506	
All other, incl. aircraft refuelers	11	388	
High Pressure (LPG, chemicals, etc.)	33	309	
Total—Tanks	409	4,807	5,960
Pole, pipe and logging			
Single axle	19	298	491
Tandem axle	54	524	672
Total	73	822	1,163
Platforms			
Racks, livestock and stake	50	1,227	2,451
Grain bodies, all types	110	946	1,285
Platforms (flats), all types	520	5,662	6,342
Total—Platforms	680	7,835	10,078
Low-bed heavy haulers	148	2,172	2,734
Dump trailers	177	2,302	1,948
All other trailers	184	1,843	3,419
Total—Complete Trailers	4,195	42,821	54,133
Trailer chassis[1]	258	2,973	4,086
Total—Trailers and Chassis	4,453	45,794	58,219

[1] Sold separately.

REGIONAL SALES OF NEW PASSENGER CARS

Zone	Region	November 1958	October 1958	November 1957	Eleven Months 1958	Eleven Months 1957	Per Cent Change Nov. over October	Nov. over Nov. 1957	Eleven Months 1958 over 1957
1	New England	16,961	20,311	21,061	233,439	295,023	−16.49	−19.47	−20.87
2	Middle Atlantic	63,023	60,186	75,166	900,143	1,052,057	+ 4.71	−16.15	−23.94
3	South Atlantic	45,080	44,713	57,123	539,398	699,902	+ .82	−13.51	−22.93
4	East North Central	80,982	74,201	94,851	959,733	1,336,309	+ 9.14	−14.62	−28.18
5	East South Central	15,246	14,330	18,106	178,804	258,826	+ 6.39	−15.80	−30.92
6	West North Central	27,199	28,094	33,720	394,230	476,348	− 3.19	−19.34	−17.24
7	West South Central	31,993	28,703	44,311	374,907	517,015	+11.46	−27.80	−27.49
8	Mountain	12,034	12,706	15,170	154,194	187,878	− 5.29	−20.67	−17.93
9	Pacific	46,363	41,647	54,026	498,796	648,542	+11.32	−14.18	−23.09
	Total—United States	338,881	324,891	408,534	4,133,644	5,471,900	+ 4.31	−17.05	−24.46

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt. Zone 2—N. J., N. Y., Pa. Zone 3—Del., D. of C., Fla., Ga., Md., N. C., S. C., Va., W. Va. Zone 4—Ill., Ind., Mich., Ohio, Wis. Zone 5—Ala., Ky., Miss., Tenn. Zone 6—Iowa, Kan., Minn., Mo., Neb., N. D., S. D. Zone 7—Ark., La., Okla., Tex. Zone 8—Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo. Zone 9—Cal., Ore., Wash.

1958 TRUCK FACTORY SALES BY G.V.W.

As reported by the Automobile Manufacturers Association

Period	6,000 lb. and less	6,001-10,000 lb.	10,001-14,000 lb.	14,001-16,000 lb.	16,001-19,500 lb.	19,501-26,000 lb.	26,001-33,000 lb.	33,000 lb. and over	Total
First Quarter	111,337	32,659	3,507	22,913	25,006	13,661	8,674	6,725	224,482
Second Quarter	104,198	33,127	3,804	23,112	26,619	14,025	6,984	7,996	219,865
Third Quarter	82,005	23,778	2,575	15,052	18,752	10,848	6,840	6,785	166,633
Total—Nine Months	297,540	89,564	9,886	61,077	70,377	38,532	22,498	21,506	610,980
October	36,723	9,338	687	3,528	9,479	4,710	3,226	2,288	69,979
November	52,030	12,057	1,574	8,224	8,507	3,228	1,867	1,921	89,408
Total—Eleven Months 1958	386,293	110,959	12,147	72,829	88,363	46,470	27,591	25,715	770,367
Total—Eleven Months 1957	500,705	148,142	34,680	151,656	65,977	48,661	35,042	31,153	1,016,016

AUTOMATION NEWS REPORT

AUTOMATIC CONTROLS

PRODUCTION—VEHICLES—AIRCRAFT

By Samuel Cummings

TAPE-CONTROLLED VERTICAL TURRET LATHE

Costs for short-run jobs are cut by a vertical turret lathe that takes its orders from a tape-control system, according to Giddings & Lewis Machine Tool Co.

The new G&L control gives users quicker setup, faster operation between cuts, higher cutting speeds, and consistent high quality of finished workpieces, say G&L officials.

The tape completely controls feed speeds, turret indexing, automatic dwell and coolant supply; also, such auxiliary functions as constant cutting speed, thread cutting, drum scoring, cutting of tapers, and step turning.

A unique feature which makes the machine more practical for general shop use, says G&L, is the override adjustment control. With this device, it now is possible to change the original programming during setup or in actual operation. For example, the operator can make adjustments for height or radius and the new data automatically becomes part of the taped program.

The new adjustment can be used to compensate for tool wear, especially during long production runs. Cutting tools can be positioned over a range of plus or minus 0.010 in., thus making it easier to hold critical workpiece dimensions. When tools are changed, the operator simply returns the adjustment to the original setting.

The override adjustment also allows users with more than one of these lathes to use tapes interchangeably between machines. Original engineering and program data thus can be stored as a perfect master, regardless of individual setup or operating variables.

AUTOMATICALLY PREPARED TAPES

A new system called Compac that automatically prepares tapes to control machine tools has been developed by Industrial Controls Section, Bendix Aviation Corp.

Compac has turned out tapes for machining two- and three-dimensional parts from drawings, Bendix reported. These parts include turbine blades, cams, molds, forgings and stamping dies, templates, integral panels, and forged fittings.

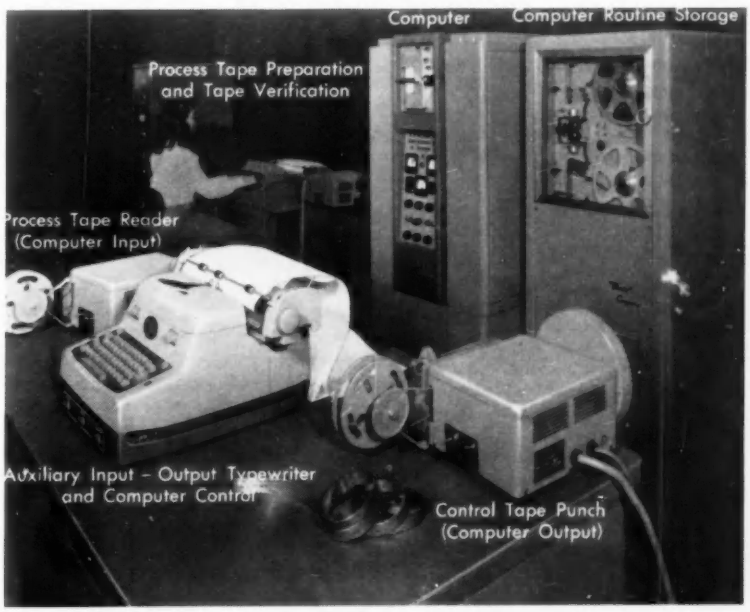
Equipment consists of a prepared form, called a process sheet; a special typewriter (Flexowriter) with a tape punch; a Bendix general purpose digital computer; and a set of computer programs.

The system works in this way:

The process sheet prepared from the part drawing lists dimensions in the desired cutting sequence, plus machine feed rates, cutter diameter, and tolerance.

This information is fed to the Flexowriter, where it is condensed, punched into a process tape, and inserted into a reader that works together with the computer. The tape is read by the computer, which automatically produces the control tape for the machine tool.

The computer's job is to figure out the cutter center locii; interpolate curve sections to provide a straight line path for the cutter; translate feed rates into required speeds of the individual machine slides; change decimal input data into coded binary form; and calculate parity checking information. ■


Computer
Computer Routine Storage
Process Tape Preparation and Tape Verification
Process Tape Reader (Computer Input)
Auxiliary Input – Output Typewriter and Computer Control
Control Tape Punch (Computer Output)

Sequence of operation in new Bendix Compac system for producing control tapes

AVIATION MANUFACTURING

Continued from Page 22

automotive products in 1958 amounted to $83 million, a 29 per cent decrease from the previous year, about the same decline as overall automotive production.

Missiles sales totaled $78.8 million or 13 per cent of the total. Unfilled orders for missiles and missile components totaled $107,400,000.

The company's total backlog was $465 million, a decline of 11.5 per cent from the $526 million backlog a year ago.

The report emphasized the growing importance of Bendix in the field of electronics. Mr. Ferguson said that approximately 40 per cent of all the firm's work directly involved the design and manufacture of electronic equipment.

Military aviation accounted for $349 million, or 56 per cent of total sales, the report stated. This was a decrease of 12 per cent from the previous year.

Commercial aviation sales were $47.6 million. This was somewhat higher than in 1957, "and helped to offset the decline resulting from reduced military aircraft procurement," the report stated.

Mr. Ferguson, in commenting on automotive sales, pointed out that sales of power steering were strong, reflecting an industry increase in usage from 19 per cent in 1954 to 41 per cent in 1958.

Bendix also benefited indirectly from the increased sales of foreign cars, Mr. Ferguson said, through the supply of equipment made by Bendix subsidiaries and licensees abroad.

Convair Gets Navy Contract For Advanced Terrier Missile

The Navy announced it has awarded a $31.4 million contract to Convair Div. of General Dynamics Corp. for production of an advanced version of the Terrier, a surface-to-air guided missile.

The contract calls for improved guidance features and improvements in coverage over the present operational features of the Terrier.

The Terrier is an all-weather missile designed to intercept enemy aircraft at longer range and greater altitudes than conventional anti-aircraft guns.

Under present shipbuilding programs, the Terrier will be used on carriers, guided missile cruisers and frigates and on several nuclear-powered ships.

The advanced missile, like the original Terrier, is intended both for shipboard use and beachhead operations with the Marine Corps.

X-15 SPACE SHIP PAINTED BLACK

X-15 space ship shown here with a coat of black enamel is expected to generate temperatures as high as 1200 F throughout the plane's structure when it reenters the atmosphere. The problem is not one of reflecting heat away from the surface, such as the sun's ray, but of radiating aerodynamic—or absorbed—heat. Black enamel was chosen, North American Aviation engineers say, because it radiates heat faster than any other color. The enamel was developed by Rinshed-Mason Co., Detroit, Mich.

Beechcraft Super 18 Aircraft To Have Standy Rocket Power

Beechcraft Aircraft Corp. announced it is offering standby rocket power as optional equipment on its twin-engine Super 18 executive aircraft.

The rocket engine, called Junior JATO (jet-assisted takeoff), will be installed on top of each wing within the nacelle fairing of the Super 18, the announcement said. Each unit will deliver 250 lb of thrust (equivalent to about 100 hp at climb speeds) for a period of 15 seconds.

The Junior Jato, developed by Aerojet-General Corp., is a smaller version of that firm's 15KS-1000-A1 aircraft rocket engine, designed for military and civilian planes.

Beechcraft said the Super 18 is the first civil aircraft below 10,000 lb gross weight to be equipped with Junior Jato.

Titan To Get New Lease of Life Under AF Missile Firing Plans

Strategic missile firing plans give new life to the Titan missile project, until recently considered a likely candidate for a cutback.

The Air Force wants Congress to permit the ordering of enough Titans to equip eleven squadrons. Earlier plans called for only four squadrons of these still-building missiles. The expected number of missiles per squadron is ten.

The Titan ICBM, being developed by Martin Co., is designed as a more advanced weapon than the Atlas. Work on it has moved less rapidly than on the Atlas, and it may not be ready for deployment for two years.

There were indications during 1958 that funds for the Titan might be reduced and that it might never become an operational weapon. It was argued in some military quarters that the Titan would not be needed because of the success of the Atlas and the coming development of the Minuteman.

But the Titan now is seen as, possibly, a harder-hitting missile than the Atlas and capable of flying farther with its payload. On the basis of defense against enemy attack, the Titan is to be dispersed in protected underground shelters. Presumably it would be harder to knock out of action than the Atlas.

1959 Technical Report No. 2

Piston ring progress...*again*

When your heart is in what you do, you think about it quite a bit.

We at Perfect Circle think constantly about piston rings...better piston rings...better ways to make piston rings.

Now we make another step forward—a major step that comes from looking at piston rings in their functional relationship to the whole engine assembly.

The pursuit of efficiency and compact engine design creates a demand for space and weight saving. Pistons eventually must be made shorter and lighter —provided shorter pistons can be sealed effectively. Shorter pistons will allow shorter cylinders and blocks, with saving in space and weight. How can we seal shortened pistons? Combining the conventional intermediate compression ring and the oil ring appeared to be a logical solution...we are now confident that it is.

After an intensive program of dynamometer and field testing we are now presenting the initial design of our ring.

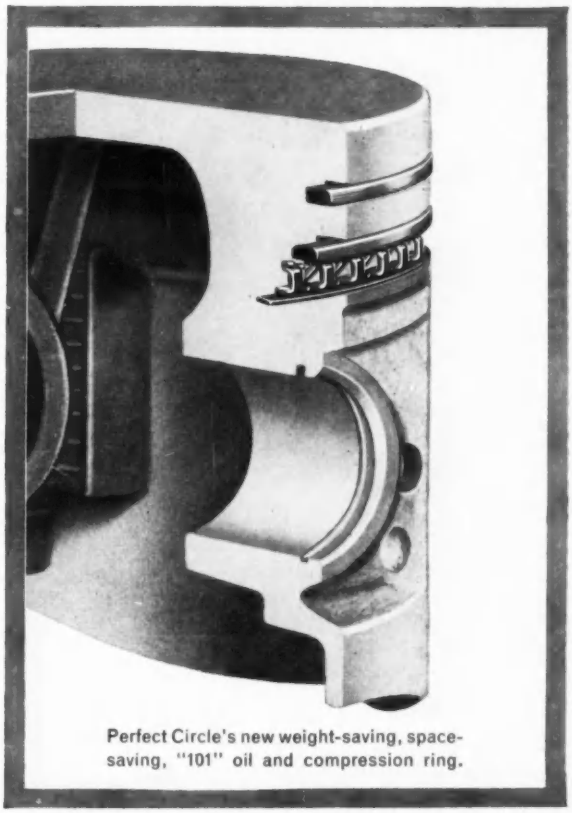
This is what our new type piston ring will do:

Save space. Reduce overall piston height up to ¼", saving same height in engine block. Reduce total engine weight. Lower reciprocating weight.

Control oil and seal compression as well as or better than current piston ring complements.

Reduce ring friction up to ten percent. Reduce wear area in cylinder.

Operate carbon-free even in heavy-duty use.



Perfect Circle's new weight-saving, space-saving, "101" oil and compression ring.

When you are confronted with problems involving piston rings or related engine components, we would appreciate the opportunity to work with you in research and engineering. Perfect Circle Corporation, Hagerstown, Indiana; The Perfect Circle Co., Ltd., Don Mills, Ontario, Canada.

PERFECT CIRCLE

News of the MACHINERY INDUSTRIES

By Charles A. Weinert

Roll-Forming Machine of Record Proportions and Greatly-Increased Capabilities Has Been Developed and Built for Ramjet Component Production

Hufford Develops Giant Roll Former

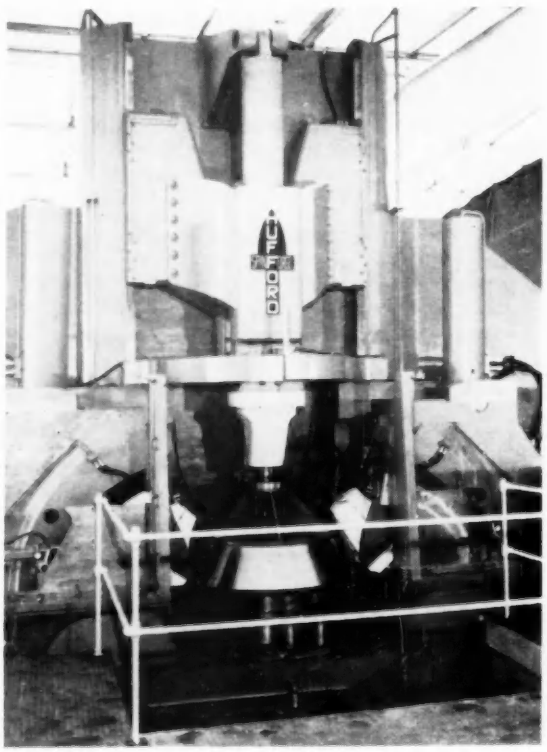
Siegler Corporation's Hufford Div. has completed the development of a big roll-forming machine that can form a one-inch thick piece of 321 stainless steel. Called the Spin Forge, it is capable of handling parts up to 60-in. diam and 10 ft high, within tolerances of ±0.003 in. The machine tool is 25 ft wide, 24 ft high with base, and weighs more than 450,000 lb—reputed to be the largest of its kind produced to date.

In forming a component, the material is placed on the unit's mandrel, which is shaped to the desired part configuration, and held in place by a vertical tailstock (hydraulic ram) that can exert a force of 200,000 lb. The mandrel is rotated at speeds infinitely variable from 10 to 400 rpm; and two working rollers, set across from each other at either side of the mandrel, come in and force the metal over and around the form. These tool rings, hydraulically actuated, apply up to 225,000 lb of force both horizontally and vertically.

Automatic control of the Spin Forge during forming operations is provided by an electronic-hydraulic tracer system custom-built by Minneapolis-Honeywell. This system continuously synchronizes and controls the position of the tool rings both horizontally and vertically. It also maintains a constant feed per revolution of the rotating material and a constant surface speed across the face of the material according to template variations.

The first Spin Forge built was ordered by Marquardt Aircraft Co. It has undergone acceptance tests and a period of trial production at Hufford's El Segundo, Calif., plant, and will soon be shipped to Marquardt's Ogden, Utah, facility for use in ramjet engine component production.

Two more Spin Forge machines are now being fabricated, according to Dan W. Burns, Hufford Div. president. One of these is scheduled for delivery later this year to General Electric Co. for roll-forming jet engine components at GE's Evandale, Ohio, plant. The other unit, with a capacity for forming 71-in.-diam parts, will be used by Hufford for further development purposes.



The Hufford Spin Forge, first in a new line of big roll formers, can form metals such as one-inch-thick stainless steel into aircraft and missile components. Developed by the Hufford Div. of The Siegler Corp. at El Segundo, Calif., it has a dimensional capacity for roll-forming parts up to 60 in. in diameter and 10 ft in height.

Around the Industry

Landis Tool Co.—has acquired the line of surface grinders previously made by **Abrasive Machine Tool Co.** Manufacturing and sales will be transferred to the Landis plant at Waynesboro, Pa.

Roto-Finish Co. — Gunther W. Balz, president, announces the purchase of **Ransohoff, Inc.** R. E. Wigger, vice-president of Ransohoff, Inc., has been made executive vice-president in charge of the Ransohoff operations at Hamilton, Ohio.

Sahlin Engineering Co., Inc.—Joseph J. Hauser has been appointed sales manager. ■

Circle 118 on Inquiry Card, for more Data ⟶

Roebling Tire Bead Wire: Packaged for Maximum Benefit

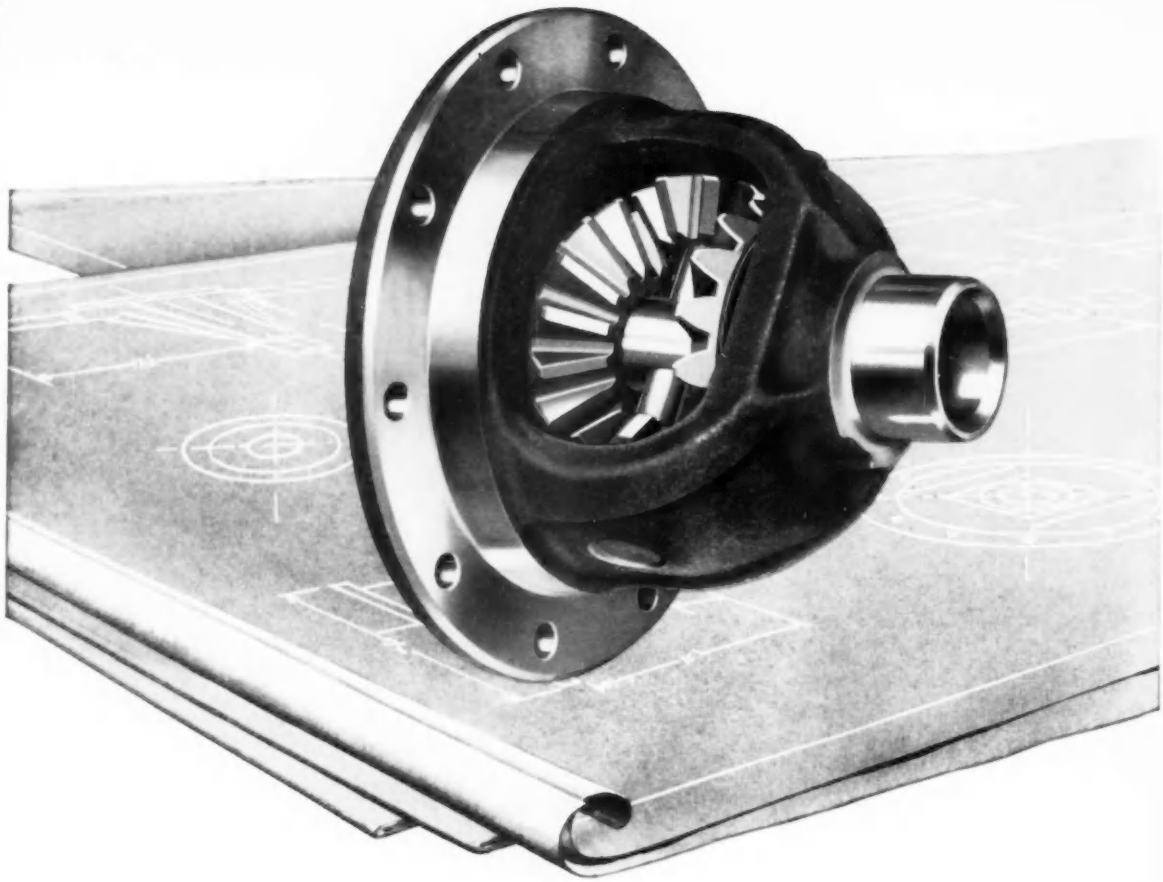
The problems eliminated by this unique reel-less core packaging system are manifold. Loads are palletized two cores per pallet and may be stacked two or three high. This, plus the fact that you need not accumulate empty reels means storage space requirements are cut to *less than half*. You do away with all freight and handling costs on reels, the bother and expense of "bookkeeping" returnable reels, and the freezing of money in reel deposits.

This is typical of Roebling's advanced packaging methods—that makes handling Roebling high-quality wire so much easier. For details on this efficient Roebling Tire Bead Wire packaging method, or information on other types of Roebling wire, write Wire and Cold Rolled Steel Products Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities

Subsidiary of The Colorado Fuel and Iron Corporation



Save the cost of tooling up! . . . Specify Spicer components in your new axle design

The easy, economical way to design even the most unusual new axle is to build it around one or more Spicer components...this stock differential assembly, for example.

So why not recheck your blueprints? 9 out of 10 times you'll find Spicer can deliver just the differential assembly you need for your latest front or rear driving axle . . . at a fraction of the cost of producing a new design.

What's more, samples can be obtained quickly for any new development program.

The easiest way is to contact your Dana representative. He'll be glad to match up any number of Spicer axle components to create . . . at the lowest possible cost . . . just the axle you have in mind.

Spicer also has a line of rear and front driving axles with load carrying capacities from 1000 to 7500 lbs.

Be sure to write for Bulletin No. 364. It gives you all the dimensions you need to start designing with Spicer differential assemblies.

DANA Spicer

DANA CORPORATION • **Toledo 1, Ohio**

DANA PRODUCTS Serve Many Fields:

AUTOMOTIVE: Transmissions, Universal Joints, Propeller Shafts, Axles, Powr Lok Differentials, Torque Converters, Gear Boxes, Power Take Offs, Power Take-Off Joints, Clutches, Frames, Forgings, Stampings.

INDUSTRIAL VEHICLES AND EQUIPMENT: Transmissions, Universal Joints, Propeller Shafts, Axles, Gear Boxes, Clutches, Forgings, Stampings.

AVIATION: Universal Joints, Propeller Shafts, Axles, Gears, Forgings, Stampings.

RAILROAD: Transmissions, Universal Joints, Propeller Shafts, Generator Drives, Rail Car Drives, Pressed Steel Parts, Traction Motor Drives, Forgings, Stampings.

AGRICULTURE: Universal Joints, Propeller Shafts, Axles, Power Take-Offs, Power Take-Off Joints, Clutches, Forgings, Stampings.

MARINE: Universal Joints, Propeller Shafts, Gear Boxes, Forgings, Stampings.

Many of these products manufactured in Canada by Hayes Steel Products Limited, Merritton, Ontario.

Circle 119 on Inquiry Card, for more Data

Circle 120 on Inquiry Card, for more Data ⟶

It's your move ... BUT PLAY SAFE!

SELECT GARLOCK MOLDED AND EXTRUDED RUBBER PARTS FOR ASSURED QUALITY

You can be sure of consistent high quality when you specify Garlock molded and extruded rubber parts. Why? Because Garlock has broad experience in compounding natural and all synthetic rubbers including silicone. Whether your problem involves temperature extremes, difficult liquids or gases, compression set, abrasion, or tear resistance—Garlock engineers can recommend a material and design best suited for the job. Moreover, Garlock manufacturing facilities are available for large quantity production of molded and extruded parts.

Molded and Extruded Rubber Products are another important part of "the Garlock 2,000" . . . two thousand different styles of Packings, Gaskets, and Seals for every need. The only *complete* line. That's why you get unbiased recommendations from your Garlock representative. Call him today, or write for Folder AD-147.

THE GARLOCK PACKING COMPANY, Palmyra, N.Y.

For prompt service, contact one of our 30 sales offices and warehouses throughout the U.S. and Canada.

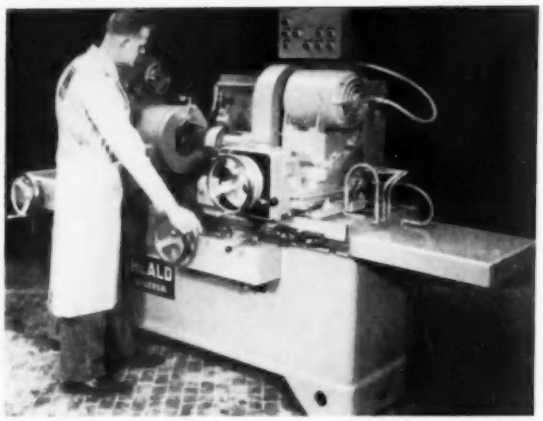
GARLOCK

Packings, Gaskets, Oil Seals, Mechanical Seals, Molded and Extruded Rubber, Plastic Products

NEW PRODUCTION and PLANT EQUIPMENT

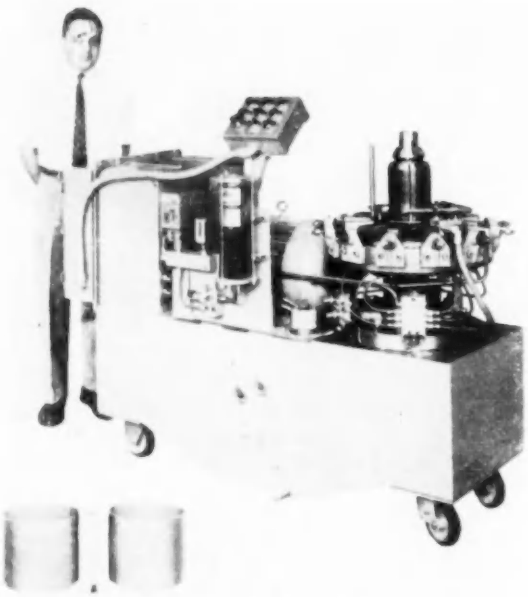
FOR ADDITIONAL INFORMATION, please use reply card at back of issue

Grinder For Bore, OD And Rotary Surface Grinding



This universal grinder for bore, OD, and rotary surface grinding is capable of tolerances within 50 millionths roundness. A new development featured on the machine is Hydrostatic antifriction ways. The table and cross-slide are supported on "pockets" of oil without metal-to-metal contact. Table speeds of 0.15 fpm for grinding and 35 fpm of rapid traverse are possible. (The Heald Machine Co.)

Circle 75 on postcard for more data



Grotnes Model 8-H-60-25 self-contained expander for forming electric motor shells. The head is equipped with 12 jaws with removable wear shoes. Lubrication and loading are automatic.

Self-Contained Expander Forms Electric Motor Shells

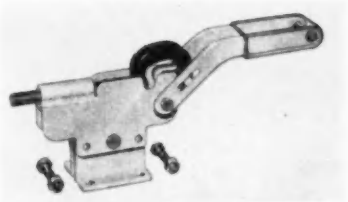
DESIGNED specifically to form and size electric motor shells in several sizes, the mobile feature of this expander provides the user with maximum efficiency, since it can be moved from one line to another as needed, without any loss of the accuracy and precision needed for the finished product.

Named Model 8-H-60-25, the unit is self-contained and requires only a connection to an external electric power source to operate. The machine develops a drawbar pull of 25 tons, and with modification of the hydraulic system and drawbar design will develop 60 tons. The 25 ton model, with the head shown, will handle parts within the following range: Inside diameter of from 3½ to 16 in., mild steel, maximum height of 8 in. *Grotnes Machine Works.*

Circle 76 on postcard for more data

Push-Pull Clamps

A PUSH and pull clamp line is available in two hand-operated and one air (or oil) operated model for remote control with 85 psi. They are designed to apply up to 1200 lb clamping force. Built-in deflection



Lapeer Knu-Vise push-pull clamp

provides uniformly tight clamping of parts with normal variation in stock thickness. Widely separated hardened steel guide bushings increase accuracy in motion and reduce wear.

The swivel base model provides 90 degree total change in clamping direction. Failure of air (or oil) pressure does not permit reverse motion, thus does not affect clamping force. All parts are easily replaceable. *Lapeer Mfg. Co.*

Circle 77 on postcard for more data

Liquid Lock

LOCTITE sealant is a thin liquid plastic that hardens without shrinkage when confined between closely fitting metal parts. It is easy to apply, and requires no heat or mixing. It eliminates the need for interference fits on bearings, sleeves, shafts and studs and locks nuts to bolts. It also seals piping and tubing joints. *American Sealants Co.*

Circle 78 on postcard for more data

(*Turn to page* 54; *please*)

NOW...AT INLAND...500,000 ADDITIONAL TONS CAPACITY FOR COLD ROLLED SHEET PRODUCTS . . . a half-million more tons of the same uniformly dependable steel that has made *Inland Quality* the recognized standard among manufacturers throughout the great Midwest. Inland's giant, new 4-stand tandem mill, most powerful of its size in the industry, is part of Inland's program of expansion, keeping pace with the growth of Midwest manufacture. New pickling, continuous normalizing, annealing and tempering facilities do their part in producing this quality steel for your use. This new capacity means better service for you from Inland.

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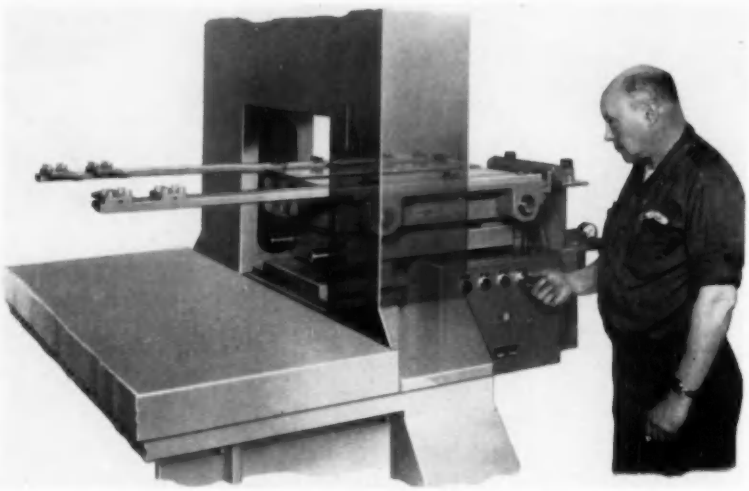


PAS Trans-Feed unit converts single-action presses into transfer feed presses

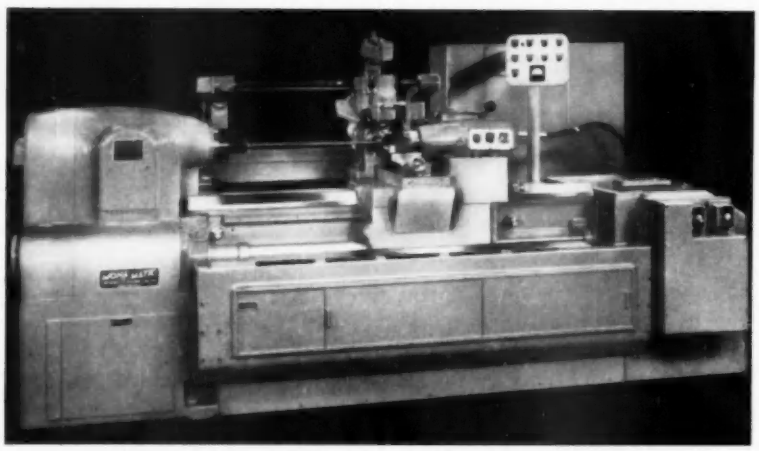
Automation Unit Converts Single-Action Presses

THIS versatile automation unit converts any single-action press into a transfer feed press. Called the Trans-Feed, the unit will feed strip stock or parts into and out of press die areas automatically. It can feed material between dies in a press or transfer and feed two or more presses in a line.

The PAS Trans-Feed bolts on the press bolster plate and can be moved from one press to another to provide automation for job-lot pressroom operations. Cast aluminum construction reduces weight and inertia forces of the unit.

All JIC standard electric controls for the Trans-Feed cycle are enclosed in a push-button panel on the side. A plug in the side of the panel permits the press controls to be tied in electrically with the Trans-Feed and cause it to operate in sequence with the press. *Press Automation Systems, Inc.*

Circle 79 on postcard for more data



Monarch production lathe for long, slender, contoured work pieces

Production Lathe For Long, Slender Work Pieces

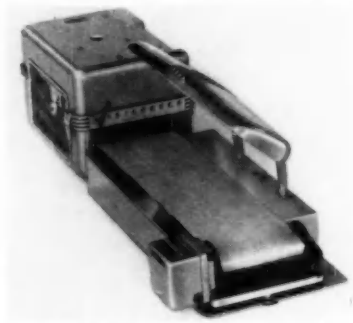
LONG slender work pieces, especially those which are tubular can be machined on the Model 21 Mona-Matic Lathe equipped with a tracer controlled follow rest.

Anti-friction follow rest rollers are mounted above and behind the work piece. Each roller is moved in and out by its own hydraulic cylinder, which is controlled by a separate "air gage tracer." Another follow roller, spring loaded, is located adjacent to and immediately following the tool. Turning is accomplished under "air gage tracer" control, the tracer slide being set at a 90 degree angle to the work. The template, in the form of a master work piece, is traced by three tracer heads. The front head controls the tool; the other two heads correspond in position to the follow rollers they control. Variable hydraulic feed up to 40 ipm is provided. *The Monarch Machine Tool Co.*

Circle 80 on postcard for more data

Recording Oscillographs

THE Heiland Div. of Minneapolis-Honeywell Regulator Co. has developed two new models in its 906 series of direct-reading oscillographs that provide high recording frequencies and increased channel capacities. Two new accessories have also been introduced — a record latensifier shown, and a timing unit.



Heiland direct-reading oscillograph

The new Visicorders are designed to monitor and record a variety of electrical and mechanical phenomena during high-speed scientific and industrial testing operations.

Circle 81 on postcard for more data

Retaining Rings

A HIGH-STRENGTH, precipitation hardening stainless steel alloy which provides corrosion resistance at temperatures up to 1000 F is being offered as an additional metal specification for the complete line of Truarc retaining rings.

The alloy—Armco Type PH 15-7, will have application in missile parts, nuclear reactor components and other areas where retaining rings are subjected to strongly corrosive conditions. *Waldes Kohinoor, Inc.*

Circle 82 on postcard for more data

(*Turn to page* 56; *please*)

These un-retouched photographs show non-aluminized and aluminized low-alloy inlet valves after tests under similar conditions.
NOT ALUMINIZED
ALUMINIZED

For Important Savings in Your Engine Costs Use EATON Aluminized Inlet Valves

Modern high-output engines require inlet valves with superior scale resistance. Heat resistant alloys have solved this problem, but at a cost premium. Valves made of low cost materials and aluminized by the Eaton aluminizing process have corrosion resistant qualities equal to, or better than, valves made of higher priced alloy materials.

Let our engineers help you apply the cost-saving benefits of Eaton aluminized inlet valves to your engines.

Plain carbon steel valve with aluminized face after exaggerated test of 16 hours in air atmosphere at 2000° F. Note the gross oxidation of the non-aluminized stem area and the excellent condition of the aluminized seat-face and margin.

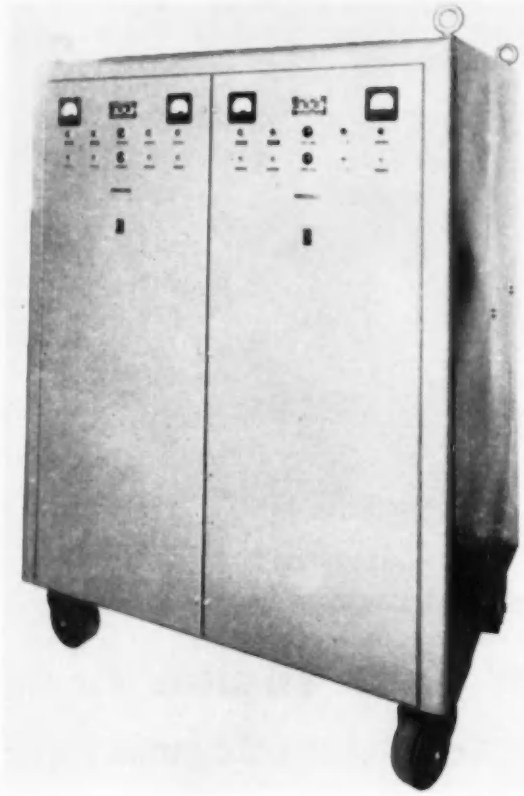
EATON

VALVE DIVISION
MANUFACTURING COMPANY
BATTLE CREEK, MICHIGAN

PRODUCTS: Engine Valves • Tappets • Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Gears • Hydraulic Pumps Truck & Trailer Axles • Truck Transmissions • Permanent Mold Iron Castings • Automotive Heaters & Air Conditioners Fastening Devices • Cold Drawn Steel • Stampings • Forgings • Leaf & Coil Springs • Dynamatic Drives & Brakes

Circle 122 on Inquiry Card, for more Data

Dual Output 12 KW DC Power Supply



Pictured is actual output 12 kw dc power supply which is for use in industrial applications and research programs. It provides two outputs of 0 to 60 volts at 200 amps simultaneously and is controlled by a motor driven powerstat. The two 12 kw sections are arranged to permit either connection in series to provide a single dc output of 0 to 120 volts at 200 amps or connection in parallel to provide 0 to 60 volts at 400 amps. The unit has an ac output of 460 volts 3-phase, 60- cps and is provided in an upright steel cabinet, mounted on casters. (Perkin Engineering Corp.).

Circle 83 on postcard for more data

Vibrating Separator Handles Wide Range Of Parts

Roto-Finish Co. has introduced a vibrating type separating machine for the separation of barrel-finished parts and abrasive media. The feature of the unit is a vibrating device which imparts high frequency, low amplitude vibrations to the screening mechanism. The bed, with a screening surface measuring 18 in. wide and 48 in. long, presents a large work area. Powered by a 220/440 v, 3-phase, 60 cycle ac motor with standrad non-reversing push button controls, it comes equipped with three screens for most standard separating operations. The unit is completely shock-mounted.

Circle 84 on postcard for more data

Encapsulating Resin

A SILICONE modified filled encapsulating resin has been developed for use in treating electronic components that require high moisture resistance and flame retardance.

It is for treatment of components such as filament, power and plate transformers for communications, fire control, radar and guided missiles. *Micarta Div., Westinghouse Electric Corp.*

Circle 85 on postcard for more data

Venturi Torch Burner

THE Bryant Hi-Lo burner provides industrial or process heating equipment such as furnaces, air heaters, ovens, and dryers with an extremely wide range of heat control. With low-pressure gas, the burner offers 10 to 1 turndown without flashback or loss of flame stability. With 10 psi gas, the burner provides 16 to 1 turndown.

A stable flame is assured throughout the heat range; the flame is adjusted automatically when the control valve changes the gas input. This simple valve controls the burner without elaborate control systems.

Bryant Hi-Lo venturi torch burner

The torch operates under furnace drafts up to 2.0 in. water column and gas pressures from 4 in. water column to 20 psig. No air blower is required. *Bryant Industrial Products Corp.*

Circle 86 on postcard for more data

(*Turn to page* 58; *please*)

IN PRODUCT AFTER PRODUCT AFTER PRODUCT . . . WEIRTON HOT- AND COLD-ROLLED SHEET

In automobiles and portable TV cabinets, in air conditioners, stoves and laundry equipment—in almost any application you can name you'll find Weirton hot- and cold-rolled sheets at work.

Their roles: helping one manufacturer after another to produce standout products at low cost with no hitches in fabrication.

You can put to good use the uniform gauge, strength and ductility of Weirton hot- or cold-rolled sheet.

Weirton is always ready to serve your needs for quality sheets. For prompt and complete service just phone or write Weirton Steel Company, Dept. T-3, Weirton, West Virginia.

WEIRTON STEEL COMPANY

WEIRTON STEEL COMPANY

WEIRTON, WEST VIRGINIA

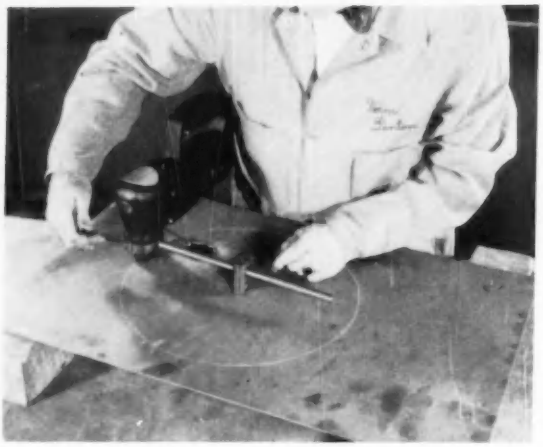
a division of

NATIONAL STEEL CORPORATION

Circle 123 on Inquiry Card, for more Data

NEW PRODUCTION and PLANT EQUIPMENT

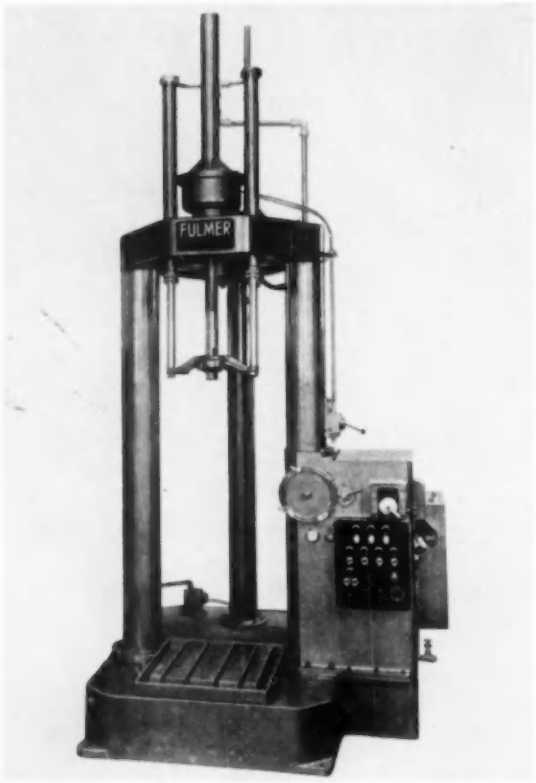
Attachment For Use With Portable Nibblers



This nibbler attachment is available for use with all Fenway portable electric nibblers. Perfect circles are possible from the limit of the nibbler's radius to unlimited diameters. The attachment has the additional feature of a straight edge guide, used to cut metal at the stock pile thus saving handling time and labor. (Pensco Products).

Circle 87 on postcard for more data

Vertical Honing Machines With Automatic Control



C. Allen Fulmer vertical honing machine series features automatic control. The machines have completely enclosed JIC hydraulic systems with large reservoirs. The coolant system is enclosed within the base, and can store two different types of honing coolant.

Two additional series of vertical honing machines have been introduced by the C. Allen Fulmer Co. The units are of the twin cylinder crosshead type, decreasing the overall height of the machines. The model 12 series offers up to 120 in. strokes and up to 35 hp.

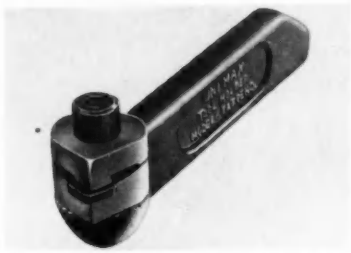
Both series include as standard equipment the Fulmer "Fulfeed" system for control of honing tools. The system retains the advantages of the mechanical brake-type honing tools, but with automatic and manual remote control of tool expansion and retraction. Featured are automatic fast feedout, timed "spark-out" cycle and retraction of the tool.

The Fulmer system can be set up for automatic operation under control of a cycle timer, or of an automatic sizer.

Circle 88 on postcard for more data

Carbide Tool Holder

UNIVERSAL-POSITIONING "Throwaway" carbide tool holders combine the economy of throwaway inserts with universal positioning for all metal turning and shaping operations. The holder eliminates the need to change holders from right to left hand or straight during a sequence of operations. When indexing the insert, it is not necessary to disturb the setup by taking this holder out of the machine. Only the cap assembly is loosened, the carbide indexed, and cap retightened. The holder remains on center of the workpiece. *Maxwell Industries, Inc.*



Maxwell "Throwaway" carbide tool holder

Circle 89 on postcard for more data

Light Weight Air Hammer

A LIGHT weight air hammer for attaching "push-on" fasteners has been announced by Superior Pneumatic & Mfg., Inc. The Model SP-900B attaches "push-on" fasteners uniformly. The device weighs 20 oz and uses 6.5 cfm at 90 psi.

Circle 90 on postcard for more data

High Speed Drive Shaft

STOW Mfg. Co. has designed a high-speed power drive flexible shaft. The rubber covered flexible shaft is for use in transmitting power at speeds of two or three times the maximum speed for the standard ball bearing flexible shaft.

It has a tight wound precision made flexible shaft core and high quality ball bearings at each end. The couplings on each end are bored to fit the particular application.

Circle 91 on postcard for more data

DURABILITY AND ECONOMY are outstanding characteristics of these timing sprockets for automotive crankshafts. These sintered metal parts are the result of close cooperation between Moraine Products and the customer. They also represent a concrete demonstration of Moraine Products' ability to produce—economically and in quantity—rugged parts that stand up under strenuous operating conditions.

Parts shown ⅔ actual size

Vital parts for Automotive Progress

Moraine Products
Division of General Motors, Dayton, Ohio

Circle 124 on Inquiry Card, for more Data

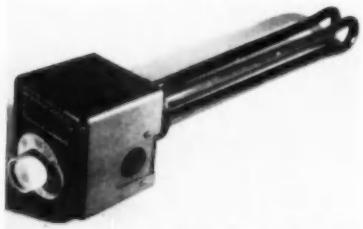
NEW PRODUCTS AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

Immersion Heaters

Thermostatically-controlled immersion heaters for heating water and oil solutions in humidifiers, quench tanks, fuel oil preheaters and many other applications have been introduced by General Electric. The water heaters have a copper sheathed heating element brazed into a brass plug and a built-in thermostat with a temperature range of 80 to 220 F. The oil heaters have a steel sheathed heating element brazed into a steel plug with a thermostat temperature range of 150 to 550 F.

Two inch headers are used on all units. Watts density for the water heaters is 55 watts per sq-in. of sheath



surface. Density for the oil heaters is 20 watts per sq-in. Over-all lengths of the heating units are from 15/¼ to 45/-¾ in.

They can be applied in jacketed containers, cleaning tanks, steam generators, impregnating waxes and alkaline baths. *General Electric Co., Industrial Heating Dept.*

Circle 60 on postcard for more data

Quick Disconnect Coupler

Able to handle liquid oxygen and nitrogen, this heavy duty quick disconnect coupler is a slip-joint type made of 300 series stainless steel, chrome plated in wear areas. Operation pressure is from 0 to 500 psi; with proof pressure of 1000 psi. Leakage at 0 to 160 psi, both connected and disconnected is said to be zero.

Operating temperature range is —325 to 500 F. The coupler comes in tube sizes ⅛, ¾, 1 and 1-½ in. *The Bruning Co.*

Circle 61 on postcard for more data

Pickling Mixture

Pickelene 300 is a dry mixture that pickels all base metals and also strips chromium. It will produce a bright, smut-free surface and gives off no objectionable fumes.

The mixture includes acid salts, activators, and surface active agents. Concentration of solution varies from 4 to 32 oz per gal, depending upon application. *Hanson-Van Winkle-Munning Co.*

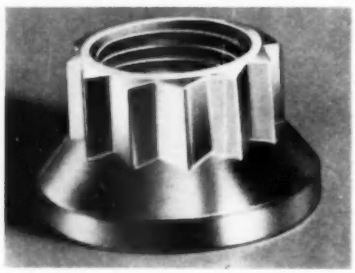
Circle 62 on postcard for more data

Featherweight Nut

A featherweight locknut of 220,000 psi tensile strength, designated the FN-22, combines a good strength-to-weight ratio with superior fatigue characteristics and high reusability.

Designed primarily for aircraft, missile and related use with bolts of 220,000 psi ultimate tensile strength, the nut also affords a favorable strength-weight ratio when used with 180,000 psi or 160,000 psi bolts.

In reusability tests under load, the



FN-22 was tightened to full load (80 percent of the yield strength of a 220,000 psi bolt) for 15 applications without critical loss of locking properties. *Standard Pressed Steel Co.*

Circle 63 on postcard for more data

Insulated Rivets

Insulated rivets are fasteners consisting of metal rivets (aluminum, brass, steel, etc.) where shank and under-the-head surfaces are covered with a uniformly thick plastic insulation. The plastic insulation, consisting of nylon, extends slightly beyond the metal rivet's head circumference and also beyond the end of the rivet.

They are used in electrical or electronic applications where it is necessary to fasten two or more metal

parts and not have the metal parts connected electrically. Other applications include riveting to ceramic or glass where the nylon sheath acts as a shock absorber to prevent cracking. *Pylon Co., Inc.*

Circle 64 on postcard for more data

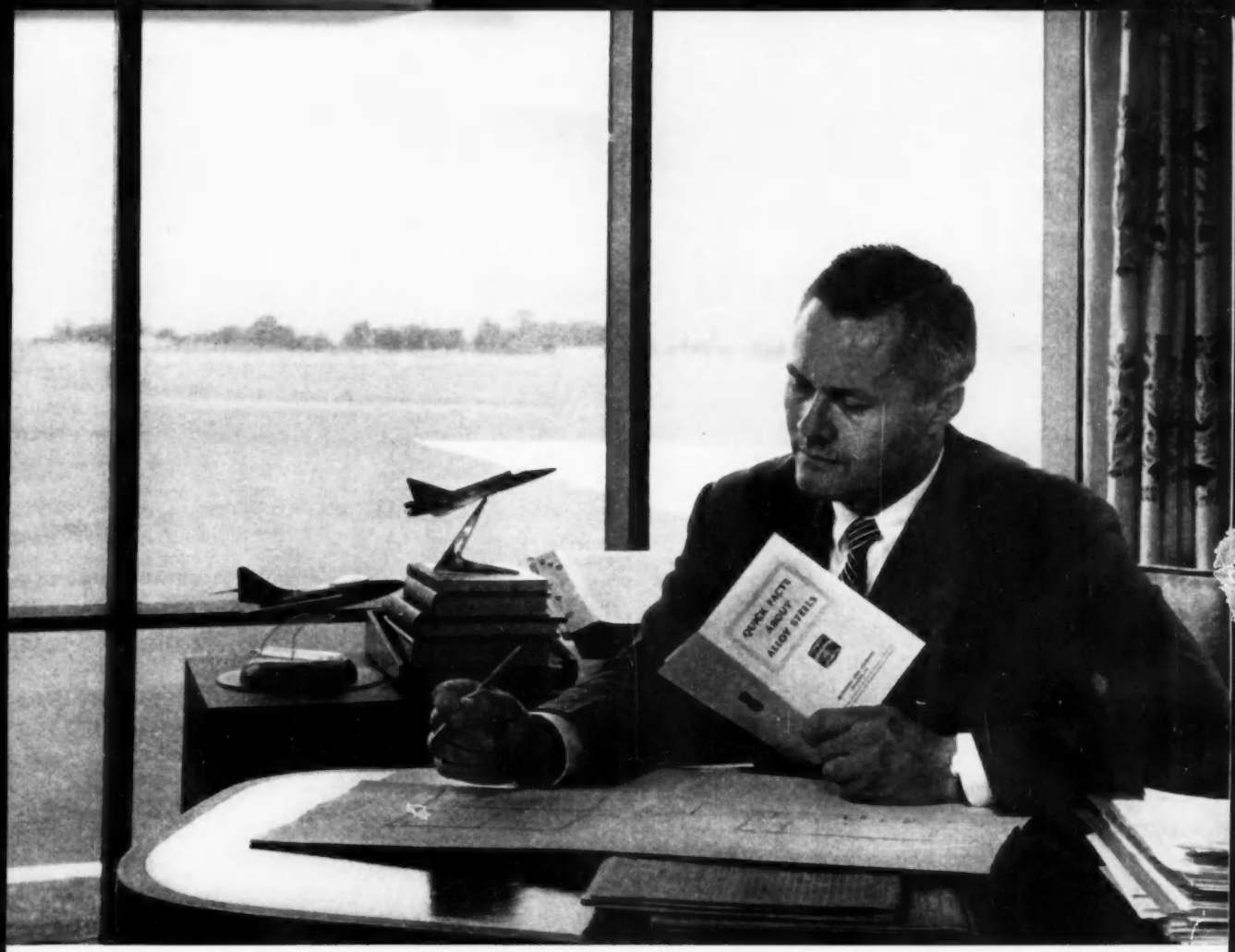
Air Line Regulators

Relieving-type air line regulators have been added to the line of "Controlled-Air-Power" devices. A built-in pressure relief valve allows increases in downstream pressure to "bleed" harmlessly into the atmosphere when such pressure exceeds the regulator setting. Adjusting the regulator knob to the desired pressure setting is all that is required.

The regulators will reduce primary line operating pressures of up to 250 psi, and will maintain desired downstream pressures of 0 to 50 psi, 0 to 125 psi, 0 to 250 psi, obtainable from separate units. *The Bellows Co.*

Circle 65 on postcard for more data

(*Turn to page 62, please*)



The little booklet on alloy steels that grew into a textbook . . .

Quick Facts about Alloy Steels appeared for the first time in 1956, as a collection of reprints of a series of Bethlehem advertisements in metalworking magazines.

The small booklet was well received, and we kept adding more of the informative advertisements as we reprinted it to keep up with demand. Today, it has grown to 40-page size, and is in its Third Edition. More than 20,000 booklets have been distributed at the written request of executives, engineers, designers, and others, who have found *Quick Facts* to be an authoritative small textbook on the fundamentals of alloy steels. Here's what a U. S. Navy engineer wrote:

"*Quick Facts* is a small textbook of information—a booklet that has been needed for a long time. One of my associates and I had a metallurgical problem involving alloy steels. We just didn't have the information. A friend showed me a copy of your booklet *Quick Facts,* and there on one page, under the subject 'Determining Depth Hardness,' was just what we wanted to know!"

The current booklet contains reprints of the complete series of advertisements, on such subjects as, "What is an Alloy Steel?" "Effects of Elements," "Grain Size," "Heat-treatment," "Quenching Media," and others. It's written in concise, layman's language, from data compiled by Bethlehem's metallurgical engineers.

Would you like a copy of the *Quick Facts* booklet? Just fill out and send in the coupon.

PUBLICATIONS DEPARTMENT, ROOM 1030
BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

Please send me your "Quick Facts about Alloy Steels" booklet.

*NAME*_____

*COMPANY*_____

*ADDRESS*_____

*CITY*_____ *STATE*_____

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

Circle 125 on Inquiry Card, for more Data

High Voltage Regulator

The Victoreen Instrument Co. has developed a series of miniaturized high voltage corona type regulator

tubes in metal enclosures for operations at voltages from 3 kv to 12 kv.

They feature superior regulation characteristics in a light, compact package and are suited for the regulation of power supplies for airborne radar due to their small size, light weight, rugged construction and ability to withstand a wide range of ambient temperatures.

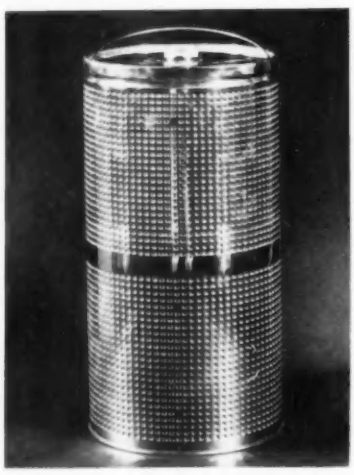
Circle 66 on postcard for more data

Filter Pack

A cellulose filter pack named Microcell is capable of removing particles of all sizes down to practically zero microns from aircraft and missile hydraulic oils.

Designed and developed for use on test stands in hydraulic oil dispensing systems, the pack provides the fine filtration needed for precise and reliable hydraulic systems performance in missiles and aircraft, and in components manufacturing and testing in these fields.

The Microcell has the capacity to remove and hold 100 to 150 grams of contaminates from hydraulic oils. *Luber-finer Inc.*



Circle 67 on postcard for more data

Gas Flowmeter Device

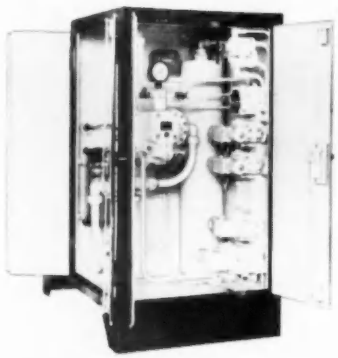
A gas flowmeter, designed by the Pottermeter Co., utilizes the principles of the Pottermeter turbine-type flowmeter to measure gas flow for nuclear, industrial, and rocket and missile propulsion applications. It operates over a temperature range of —425 F and has only one moving part.

The device measures true volumetric throughout. This data can be converted to mass flow rate or scfm by applying standard pressure-temperature electronic computing instruments and/or other suitable devices such as direct density sensors.

Circle 68 on postcard for more data

Console Power Unit

This console power unit has all its important components sealed in a



dust-tight cabinet. A 15 hp totally enclosed motor is installed alongside to allow ventilation. The main components are mounted on a drilled manifold with all of the pipe connections on the outside. On the manifold is also an outlet for the lubricating system and in the cabinet is its reservoir and hydraulically operated pump. *J. N. Fauver Co., Inc.*

Circle 69 on postcard for more data

Generator Overdrive

Called Gen-O-Drive, a generator overdrive system has been developed to assure peak generator performance and constant battery charge for all types of automotive vehicles, even at curb idle. The unit works by instantly increasing generator rotation when the engine is idling or running at low speed. As engine speed increases, Gen-O-Matic automatically returns the generator to its normal operating rate. The device requires less than ¾ hp to operate and is easily attached to automotive generators: standard, heavy duty AC. *Consolidated General Products.*

Circle 70 on postcard for more data

Electric Tachometer

An electronic tachometer has been developed for simplified digital measurement of gasoline engine or electric motor speeds, belt conveyor and slow speed shafts, etc.

Called the Dynacounter Digital Tachometer, the instrument covers

the entire range of engine speeds from 1/5 to 50,000 rpm. Reads speed to one revolution in 1/10 second; within 10 rpm in 1/100 second, at all speeds. *Dynapar Corp.*

Circle 71 on postcard for more data

Coating Process

The Nicrocoat process provides sheet metal parts with a furnace-bonded protective surface layer which resists oxidation, abrasion and corrosion. It can impart to mild steel and other low-cost metals oxidation and corrosion resistance usually found only in stainless steels and other high-

alloy metals, while at the same time providing good abrasion resistance. *Wall Colmony Corp.*

Circle 72 on postcard for more data

Circle 126 on Inquiry Card, for more Data ⟶

ADVANCED DESIGN PISTONS

By GILLETT AND EATON

for Longer Heavy Duty Service

TROUBLE-FREE with thousands in use

★ Low initial cost ★ Low cost per mile

★ Amazing increase in piston life

★ Maintains new engine power and performance

G and E WIRE INSERTS PUT CAST IRON WEAR IN TOP RING GROOVE

G and E Wire Insert Piston before machining (left) and after ring grooves are cut (right) showing how the steel wire forms a tough wear-resisting surface on both faces of top ring groove. The patented ferrous plug molded in the head (for diesel pistons) prevents burning through head and lengthens diesel piston life!

With the thousands of G and E "Wire Insert" Pistons in use for periods up to 3 years—a phenomenal record for trouble-free operation has been established. The "Wire Insert" greatly reduces top ring groove wear and increases piston life.

The "Wire Insert" piston design—exclusive with G and E—combines all the advantages of aluminum alloy pistons with the long life of steel in the top ring groove lands. No noticeable increase in weight—unequalled for rapid heat flow—and at low cost.

A pre-shaped steel wire is cast into the piston where the top ring is located. When the grooves are machined, the closely spaced wire surfaces form hard bearing areas on top and bottom faces of the groove. Result—reduced ring land wear, longer piston life at lower cost.

Get the G and E Wire Insert story today.

as LIGHT as aluminum . . . wears LIKE IRON

VANASIL*

"OIL-ABSORBING" PISTONS FOR GASOLINE AND DIESEL ENGINES

*Gillett & Eaton's trademark for a vanadium... high silicon... aluminum alloy.

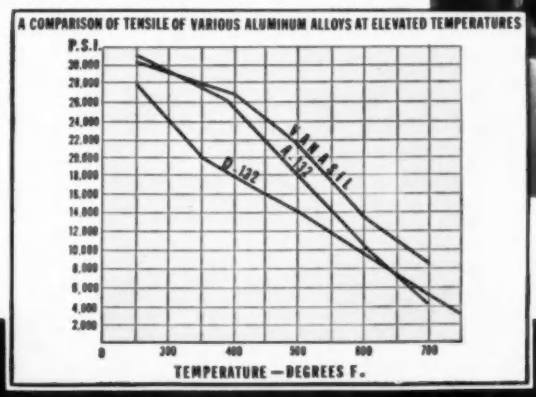
VANASIL Pistons have repeatedly run way over 200,000 miles with only .002" to .005" wear on the top ring grooves. On-the-road ring breakdowns caused by badly worn grooves are almost eliminated because *Vanasil Pistons reduce top ring groove wear up to 75%!* Nothing else compares with the genuine G & E Vanasil—the original high silicon alloy, proven by 19 years of use.

You Get ALL These Advantages Only In

GENUINE VANASIL PISTONS

G & E PROVED Vanadium... High Silicon... Aluminum Alloy

1. LIGHT WEIGHT—Same as other aluminum alloys.
2. SCORING, SCUFFING MINIMIZED—Because of "Oil Absorbing" microscopic porous texture.
3. LONGER LIFE—30% less friction—30% harder. Greater "hot strength"—see chart at right.
4. TOP RING—Breakage virtually eliminated because of reduced ring groove wear.
5. LOW EXPANSION—Characteristics of Cast Iron.
6. CLOSE CLEARANCES—Fitted with Cast Iron Clearances.
7. SOLID SKIRT DESIGN—No expansion devices required.
8. HIGH HEAT CONDUCTIVITY—Similar to other aluminum alloys.
9. PLATING—No tin or other break-in coating required.



Write for complete information and prices on Gillett and Eaton's Wire Insert and Vanasil longer lived pistons.

"Our 90th Anniversary Year"

GILLETT and EATON, Inc. 841 DOUGHTY STREET LAKE CITY, MINNESOTA

Buick Foundry

(*Continued from page* 29)

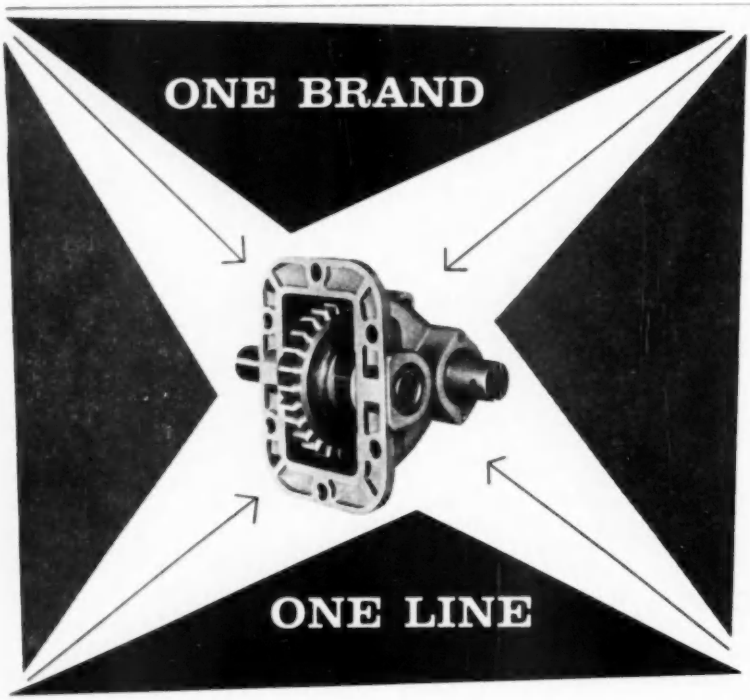
a group of core setters set the various dry sand cores, taking such cores from a monorail feeder conveyor which starts in the core room.

Meanwhile, the second molding machine is in action preparing the cope section. As the drag moves into this station, on the conveyor, the cope is indexed and closed accurately into position over the drag by means of an automatic closing mechanism. At the start of operations the cope and drag were locked by clamps in conventional fashion. By the time this article is in print, however, Buick will be employing a special weight conveyor with weights heavy enough to hold the cope and drag securely together without using clamps.

As the assembled mold now moves along the conveyor, it enters the pouring section. Then the mold conveyor makes a 180-deg turn to enter the hooded and ventilated area for removing fumes and for cooling. At the exit end of the line is a special arrangement for cope shakeout. The cope is lifted off the drag by means of an overhead mounted air cylinder, then moved over on a rail for transfer onto a Simplicity shaker grate. Meanwhile, the drag continues on the conveyor to the other Simplicity shakeout station at the end of the line.

Apart from the high productivity and economy inherent in an almost automatic mechanized line, foundry and machine shop scrap combined for the parts made on this line has gone down below two per cent.

That this line is busy may be gained from the fact that it accounts for approximately 80 tons of metal poured daily. ■



COMPLETE line for all applications
TULSA® POWER TAKE-OFFS

The complete line of Tulsa Power Take-Offs means one brand — one inventory — of highest quality, top performance power take-offs. Our ten series — and the many models within these series — provides a power take-off for all types of work and for most transmission applications. Application information for all trucks is revised annually—or more often when necessary — and is available when new truck models are released. For a complete line — with maximum interchangeability — it's Tulsa Power Take-Offs!

Tulsa Winch

DIVISION OF VICKERS, INCORPORATED • TULSA, OKLAHOMA

Ford Limited-Slip Differential

(*Continued from page* 37)

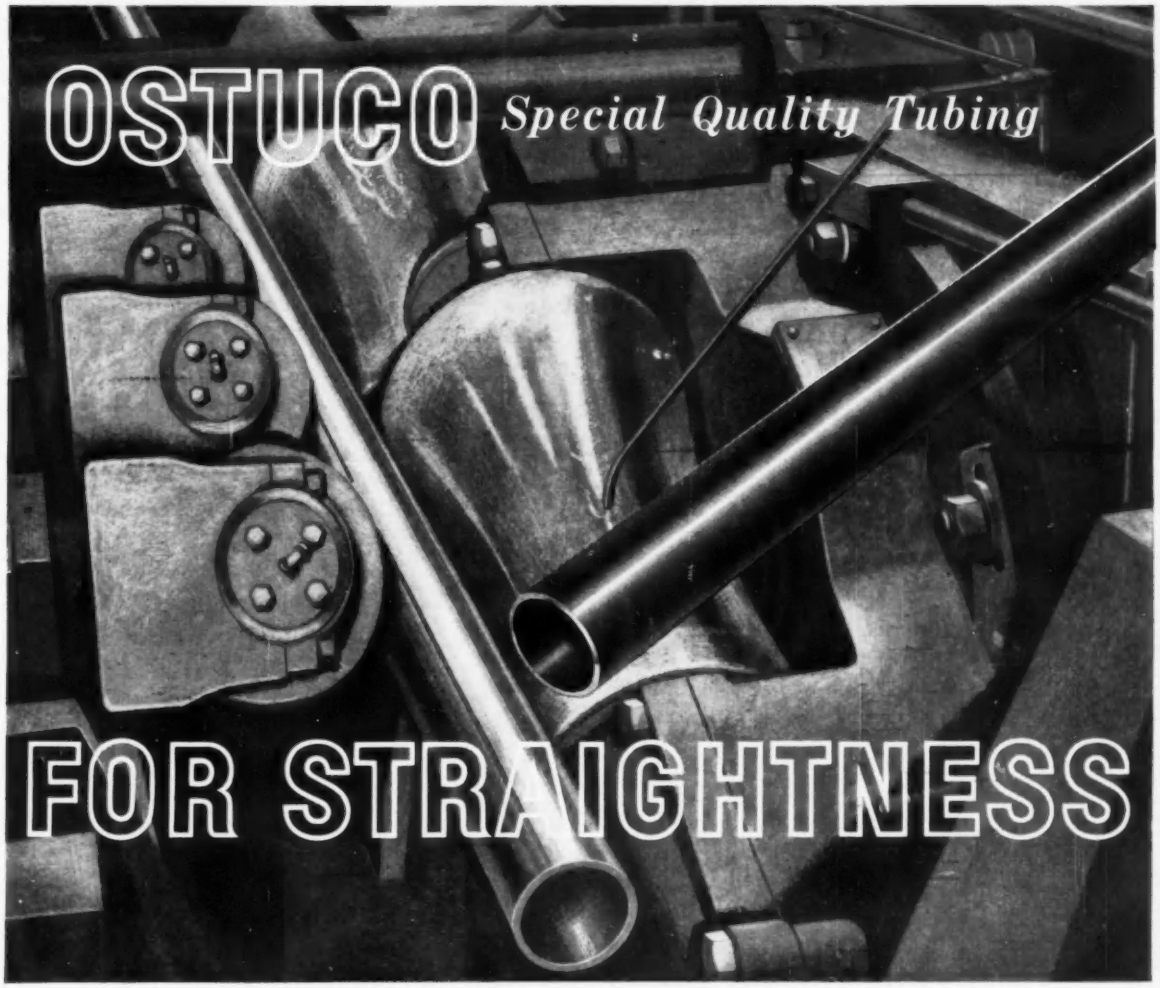
springs, conformity to standard conditions is assured by quality control.

The final step, however, is to verify the torque capacity of the assembly before the fastenings are applied. This is accomplished through the use of a unique hydraulically-operated test machine. In operation, matched sets of differential sub-assemblies, as well as pinion and ring gear sets, are placed in a suitable wire container and transported on a conveyor directly to the testing machine.

Here the operator removes the two halves of the differential and places the assembly loosely in the fixture. Hydraulic pressure then is applied against the assembly to the closed position and the clutch hub is rotated to measure and qualify clutch slip with a reading taken on the calibrated dial. If this reading corresponds to the specified range of preload, the assembly is considered acceptable. The operator then makes up three of the ten fastenings to hold the unit securely, the remaining fastenings being applied after the assembly is removed from the test fixture. ■

Circle 127 on Inquiry Card, for more Data

Helicopter Manufacturer Specifies



Straightening Ostuco Special Quality Tubing to extremely close limits at Shelby mill.

"Our specifications for seamless steel tubing used in rotor drive shafts are tough to meet. In addition to stringent O.D., wall and concentricity tolerances, we require *special straightness* — tube after tube, shipment after shipment.

"Ohio Special Quality Tubing surpasses any other tubing we have ever used. We know this to be fact. Scrap and rejects are at a new low, inspection OK's and savings on this part are at a new high."

This actual case history may parallel your own product problems. For with Ohio Special Quality Tubing it's only the *quality that's special.* For further information contact our nearest sales office, listed in the Yellow Pages, or the plant at *Shelby, Ohio — Birthplace of the Seamless Steel Tube Industry in America.*

AA-9011

OSTUCO SHELBY, OHIO — OSTUCO TUBING

OHIO SEAMLESS TUBE DIVISION

of Copperweld Steel Company · SHELBY, OHIO

Seamless and Electric Resistance Welded Steel Tubing • Fabricating and Forging

SALES OFFICES: Birmingham, Charlotte, Chicago (Oak Park), Cleveland, Dayton, Denver, Detroit (Huntington Woods), Houston, Los Angeles (Lynwood), Moline, New Orleans (Chalmette), New York, North Kansas City, Philadelphia (Wynnewood), Pittsburgh, Rochester, St. Louis, St. Paul, St. Petersburgh, Salt Lake City, Seattle, Tulsa, Wichita **CANADA:** Railway & Power Engr. Corp., Ltd. **EXPORT:** Copperweld Steel International Company, 225 Broadway, New York 7, New York

METALS

(*Continued from page* 42)

Titanium Price Cut Again

Crucible Steel Co., a principal producer of titanium products, cut prices down 10-12 per cent early in January. The move was quickly followed by other producers. This latest reduction came two months after an earlier wave of price cuts swept through the industry. Improved manufacturing and lower material costs made the price reduction possible. It is expected the new prices will stimulate the growing interest in titanium for many missile applications, as well as for use in jet engines and airframes for both military and commercial planes, and make the metal more competitive with stainless steel.

The new base price for sheet is $7.50 per pound, down from $9.10. Plates are $5, reduced from $6, and bars and billets $4.25 and $3.55 respectively. Titanium sponge has been cut to $1.62 a pound, a reduction of 67 per cent from the $5 price five years ago.

Statistically, the titanium industry is doing a great deal better than a year ago. The curtailment and cancellation of the manned aircraft program, and the shift in emphasis to missile design which resulted in drastic cutbacks from the military, is water over the dam. Output began to increase during the third quarter of 1958 and is now pointed upward with a higher share going to civilian lines, stimulated by development of new titanium alloys.

Zinc Deliveries Off from October-November Peaks

The latest statistics for zinc show in round numbers that the December smelter output of slab was up 10,300 tons and domestic deliveries were down 6500 tons from November. There was a negligible decrease in stocks, which stood at 190,200 tons at the end of 1958. However, this represented a decline of 67,700 tons from the peak figure last July. While December domestic shipments declined rather substantially from the record high rate of October and November, they still exceeded the monthly average of 1958 by 13,000 tons. Noteworthy was the excellent demand for Special High Grade, wanted by the die casters because of the improved tempo of activity in Detroit.

The Department of Commerce expects a 10 per cent increase in zinc consumption in 1959 over the 865,000 tons estimated use in 1958. Of the principal uses, zinc in alloys is expected to increase 12 per cent, zinc for brass about the same, and zinc for galvanizing 5 per cent.

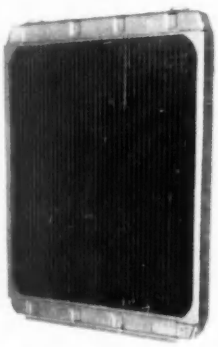
The domestic price of zinc continued to hold firm at 11½ cents through mid-January. In London there is surprising strength, with zinc continuing to sell higher than lead contrary to the usual pattern.

(*Turn to page* 69, *please*)

Young keeps the big ones running cool!

Young Radiator cools Engine Jacket Water for High-Powered Diesels

These powerful White tractors pull refrigerated trailers cross country. Rugged terrain and torrid deserts are taken in stride by these rugged Young Radiators. Our Light-Weight Stamped Tank Radiators are specially fabricated, and have *exclusive Double Lock-Seam construction.* Electronic lock-soldering of headers and tubes provide a more positive, surer construction and a stronger radiator . . . takes more stress . . . gives longer service than radiators unable to offer these features. Write or phone Young to discuss your Heat Transfer problems. No obligations, of course.



Young radiators have extra built-in strength

"Young Radiators are used where the going is tough!"

Write Dept. 109-B for Catalog 148A.

Young RADIATOR COMPANY
RACINE, WISCONSIN
Creative HEAT TRANSFER ENGINEERS
Executive Office: Racine, Wisconsin, Plants at Racine, Wisconsin, Mattoon, Illinois

Here's the way things are rolling...

Among people who know filters...

FRAM RANKS FIRST!

Drivers choose FRAM for quality! U. S. Survey shows: Among drivers who know filters by name . . . more rank FRAM first for quality than any other filter!

Car-makers choose FRAM for dependability! More automotive manufacturers install FRAM as original equipment than any other filter!

Engineers choose FRAM for efficiency! Over 400 engine manufacturers specify FRAM Filters for their full filtering ability!

FRAM
OIL AIR FUEL WATER
FILTERS

FRAM CORPORATION, Providence 16, R. I.

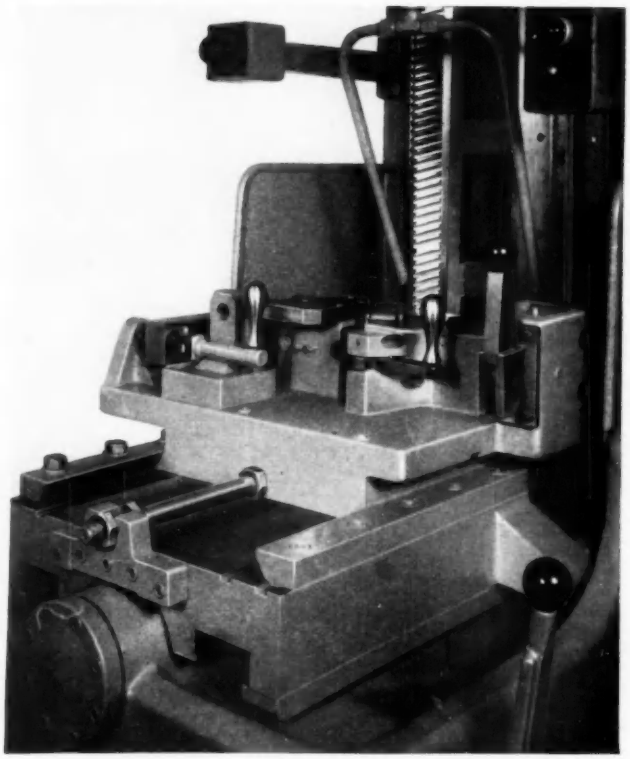
Cincinnati Equipped Hydro-Broach Machine

. . . keeps ODD SHAPES

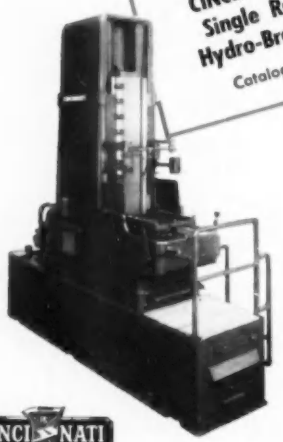
on Routine Production Schedule

Odd shapes with thin sections are often difficult to machine. Key to the problem is ingenious tooling **and** the correct size and type of machine for the operation. Cincinnati Broaching Specialists combined these two requirements to broach the half-round notch and 90° surfaces on two sizes of contact arms, one of which is illustrated below. ¶ Production and cost requirements dictated a manually operated fixture. It has two stations, and the work progresses from left to right . . . 90° surfaces broached in the left-hand station and half-round notch in the right-hand station . . . one part completed each stroke of the ram. Cincinnati Engineering Service and CINCINNATI Hydro-Broach Machines are tops for low-cost replacement equipment and new tooling for new products. Many examples are illustrated in brochure M-1599-2, "How to Step up Production with CINCINNATI Hydro-Broach Machines." Write for a copy.

SPECIAL MACHINE DIVISION
The Cincinnati Milling Machine Co.
Cincinnati 9, Ohio



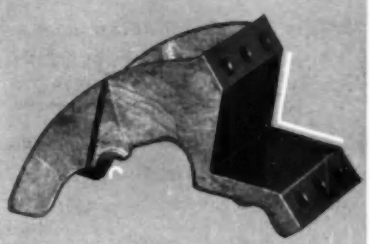
Two operations are completed each stroke of the Hydro-Broach ram. The fixture, a Cincinnati Engineering Service design, is a two-station progressive type.



CINCINNATI No. 5-42
Single Ram Vertical
Hydro-Broach Machine
Catalog No. M-1745-1

CINCINNATI

Close-up of part. Heavy lines indicate surfaces broached.



Production data:

Part name	Contact arm
Material	Aluminum bronze
Operation	Broach 90° V and small radius
Production	130 per hour

CINCINNATI®

SPECIAL MACHINES • VERTICAL AND HORIZONTAL
BROACHING MACHINES • COMPLETE PRODUCTION LINES

METALS

(*Continued from page* 66)

With a strong demand for galvanized products, higher automobile production rates, and improved call for brass products—these are the principal sales outlets for zinc—the price is likely to remain firm, even to advance over the near term.

Secretary Seaton has declared that lead-zinc quotas would be continued through 1959 as well as possibility of additional barter exchanges of lead and zinc for U. S. surplus farm products. He noted that since quotas had been imposed, zinc and lead prices had firmed. While subsidies might be introduced in the new Congress, it appears unlikely they will win approval.

Slow Demand for Lead

The lead picture is less satisfactory than that for zinc, and the 13 cent price is only maintained by the import quotas. Sales have been slow. Smelters and refiners stocks have been sharply up. While import restrictions have now been in effect for over three months, the full effect is not yet noticeable, as large tonnages were imported or withdrawn from bonded warehouses in 1958 to avoid quota restrictions. Stocks showed a steady increase every month in 1958. However, the situation may change as 1959 progresses. The Department of Commerce estimates consumption will increase 5 per cent this year, with a moderate increase in lead use for batteries, no change in use for tetraethyl gasoline. Abroad, the increased convertibility of sterling may promote demand, but it is admitted a surplus of lead now exists and some production should be curtailed to bring about a better demand-supply situation.

Higher Output Predicted for Aluminum

Aluminum demand has picked up, and leaders in the industry are forecasting a 10 to 20 per cent increase in 1959 shipments over 1958. This is confirmed by an estimate by the Department of Commerce.

Nevertheless, early in January the Aluminum Co. of Canada announced it was cutting output of primary aluminum 10 per cent, and it is apparent that other aluminum companies are fully aware of over capacity and feel that markets may continue to become more competitive. It seems doubtful that the present operating rate of the industry, now substantially less than present capacity, let alone new production facilities scheduled to come in by mid-year, will be stepped up to any extent in the immediate future. Imported metal is still available at more than 1 cent per pound delivered under the price of primary producers. It is reported that German producers have reduced their price 7 per cent to $514 per metric ton, equivalent to 23.4 cents per pound on the Continent, or the current price abroad for Canadian aluminum. ■

SHORTIES

One metering instrument used by the aircraft industry must measure the arc of an angle to two-tenths of one second. This is equivalent to the width of a ten-cent piece at a distance of 11½ miles. Another instrument measures current within one thirty-millionth of the current in a 100-watt reading bulb.

●

Orders for missiles in fiscal year 1959 will be $5,729,000,000 compared with $5,060,000,000 during fiscal 1958. This is an increase of almost 100 times over the total programmed obligations in 1947, and a fourfold increase since 1955.

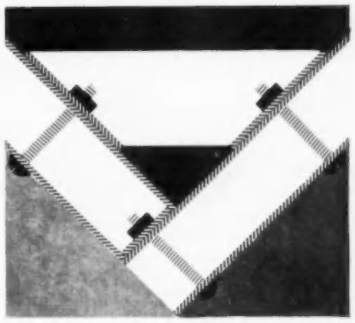
●

One helicopter taxi service flies a distance equal to 1½ times around the world monthly, yet its 'copters are never more than 16 miles from their base.

●

At any given instant the U. S. Air Force has 1150 planes in the air — almost equal to the total plane inventory of all U. S. airlines. ■

IN FASTENERS SOUTHERN IS permanence



For every fastener application that calls for uncompromising permanance, Southern has a screw to fit the job. There are no better screws made than USA-made Southern Screws. Southern Screw service is without equal. Give Southern Screw the opportunity to live up to its reputation on your next fastener order. Write us your requirements.

Address: SOUTHERN SCREW COMPANY, P. O. Box 1360, Statesville, N. C.

Machine Screws & Nuts • Wood Screws • Tapping Screws • Stove Bolts • Drive Screws • Hanger Bolts • Carriage Bolts • Wood Knob Screws • Dowel Screws

Manufacturing and Main Stock in Statesville, North Carolina

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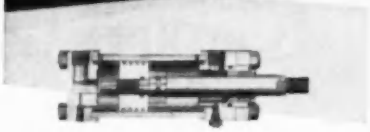
Southern SCREW COMPANY STATESVILLE • NORTH CAROLINA

Circle 132 on Inquiry Card, for more Data

sealed right!



O-M Heavy-Duty Series TH
Hydraulic (Oil) Cylinders

IF you are experiencing difficulty with leakage through the seals and packings of the cylinders you have been using, the O-M "TH" Series Heavy Duty Hydraulic cylinders may be the answer to your problem. Since their introduction in 1955 these cylinders have established an enviable reputation for efficient and trouble-free service.

The O-M Series TH Cylinders are Designed Right to Seal Right. Prior to the design of these cylinders, many tests were made and field experiences were surveyed to find the most efficient way to eliminate the old "leakage problem".

Homogeneous "O" rings, with their elastic characteristics, cannot be excelled as static seals when backed-up with plasticized leather non-extrusion rings and installed in a properly designed cavity.

Ring-type piston packings are excellent for long-life and trouble-free performance when a small amount of piston by-pass is permissible. When by-pass is not allowable, "Vee-type" packings similar to those used as standard in the rod gland provide optimum sealing. The "Vee-type" packing is self adjusting and provides multiple lip sealing with excellent pressure sensitivity and long life.

The homogeneous "lip-type" rod wiper or the metallic scraper (your choice) is located well forward so as to prevent dirt from accumulating and scoring the piston rod and damaging the bearing and packing.

O-M Series TH Cylinders are "Designed Right" and "Sealed Right". Available in 1½" to 8" bores with complete selection of mountings. Mail coupon TODAY for Bulletin No. 105 showing description drawings of cylinders mountings and capacity chart.

ORTMAN-MILLER MACHINE CO.
17 143rd Street, Hammond, Ind.

☐ Have representative call
☐ Send Bulletin 105

Name_____ Position_____
Company_____
Address_____
City_____ Zone___ State_____

Circle 133 on Inquiry Card, for more Data

President Eisenhower's plans for further cutbacks in military personnel draw protests from Congress. Ike wants to trim to just over 2.5 million men by July 1. Too much and too soon, says the influential Senate Armed Services Committee. Modern warfare requires fewer men; but allowance must be made for Korea-type limited wars, the Committee declares.

The first small business investment companies — formed with Government aid to provide equity capital and make long term loans to small firms—will be opening soon. Officials of the Small Business Administration are now processing the first half-dozen applications.

Under the law, passed last year, the Government matches the amount raised by private sources. There is a $150,000 minimum, but no maximum. Banks, insurance firms, businessmen, and investors are forming the new firms.

When in business, these investment firms may make loans of up to 20 years—with a possible 10-year extension—to small businesses. Or they may buy stock in small corporations. The SBA supervises all transactions.

SBA officials expect hundreds of these new firms to be in business by the end of this year. If the program works as planned, funds will be available to many small firms for the first time on these long terms. Interest rates, however, won't be low.

Classified Advertisement

SALESMEN WANTED: $1000.00 a month selling automotive shelving-parts bins-counters-tire and tail pipe racks-shop equipment. Terrific commissions. Free 32 page catalog—jobber discounts. Write today! BFC Corporation, 2841 E. Hedley, Phila. 37, Pa.

BEFORE...
Separate Bolts, Nuts and Washers complicate inventories, increase assembly costs.

AFTER...
Washers as integral parts of bolts and nuts eliminate problems, speed assembly at lower cost.

save money

by simplifying fastener design

Here is a simple application of a basic bolt making principle which affects substantial savings.

These savings, resulting from simplified design, are realized in every step of the operation from lower first cost of the fasteners through inventory to final assembly. Totalled, they are well worth while.

There are many other basic principles . . . often overlooked in designing and specifying fasteners, which are of importance cost-wise.

You'll find them in our new booklet, "How to specify fasteners . . . and save". Filled with drawings and charts, it makes a handy guide in designing or buying any headed parts. If you can use a copy, write to North Tonawanda or ask a Field Representative.

BUFFALO BOLT COMPANY
Division of Buffalo-Eclipse Corporation

N. Tonawanda, N. Y., Princeton, Ill.
MAKING BOTH FASTENERS AND FRIENDS FOR 100 YEARS

• *3 convenient service centers*

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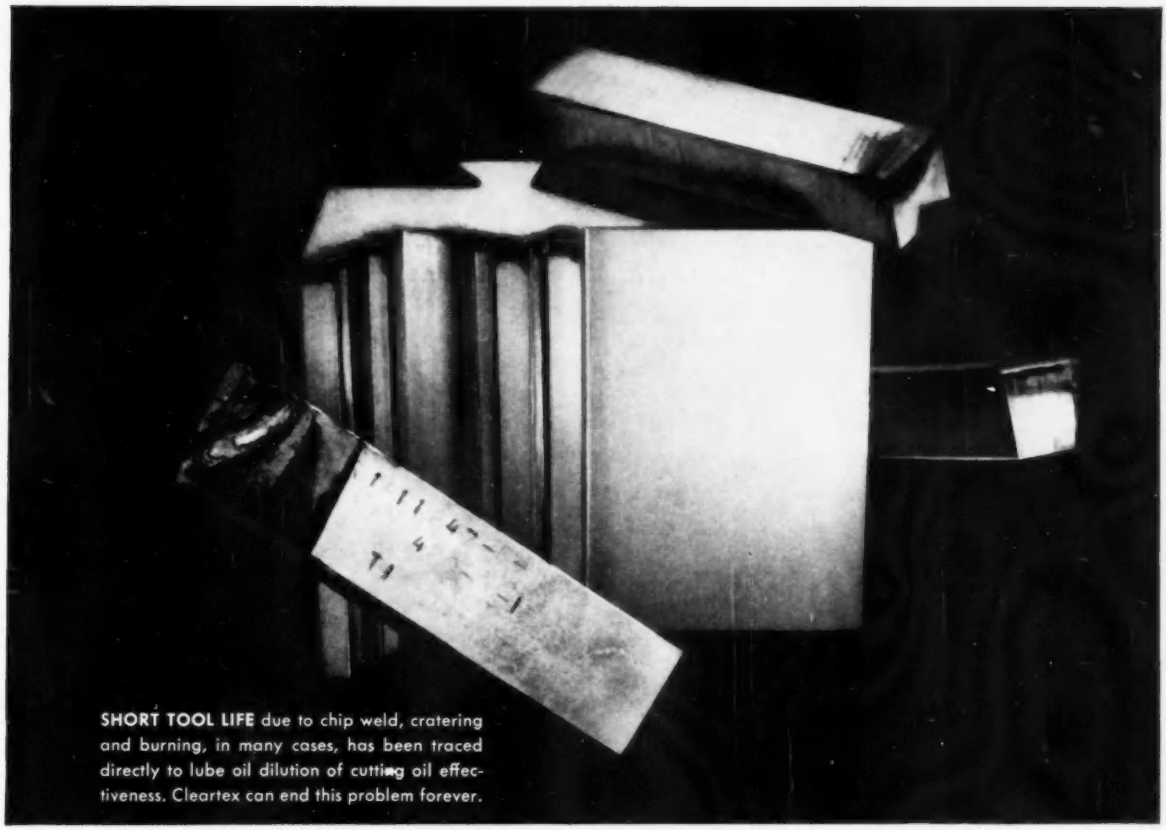


SHORT TOOL LIFE due to chip weld, cratering and burning, in many cases, has been traced directly to lube oil dilution of cutting oil effectiveness. Cleartex can end this problem forever.

It happens in 7 out of 10 automatics!

Diluted cutting oil shortens tool life drastically

Lubricating oil is probably leaking into the cutting oil sumps of your automatic screw machines as you read this. Current research proves that this is happening in 70% of all the automatics in use today! And where it happens, it shortens tool life by as much as 50%—even 70%. On top of this, the cost of extra regrinds, lost production during tool changes, and excessive scrap production is putting a premium on screw machine operation in too many shops.

Look for these symptoms. One sure sign of dilution is the need for frequent refilling of the lube oil sump. If you are using an ordinary lube oil, this dilution will create two additional—and more costly—symptoms: excessive scrap production and frequent regrinds. Now you can eliminate these forever with the

TEXACO CLEARTEX CURE

The exceptional chemical stability and load-carrying ability of Texaco's Cleartex series make them equally suitable for use as cutting oils, lubricants or hydraulic fluids. All you have to do is use them for both cutting *and* lubrication. With Cleartex in *all* your sumps, you'll find cutting oil dilution will stop and screw machine production cost will drop substantially.

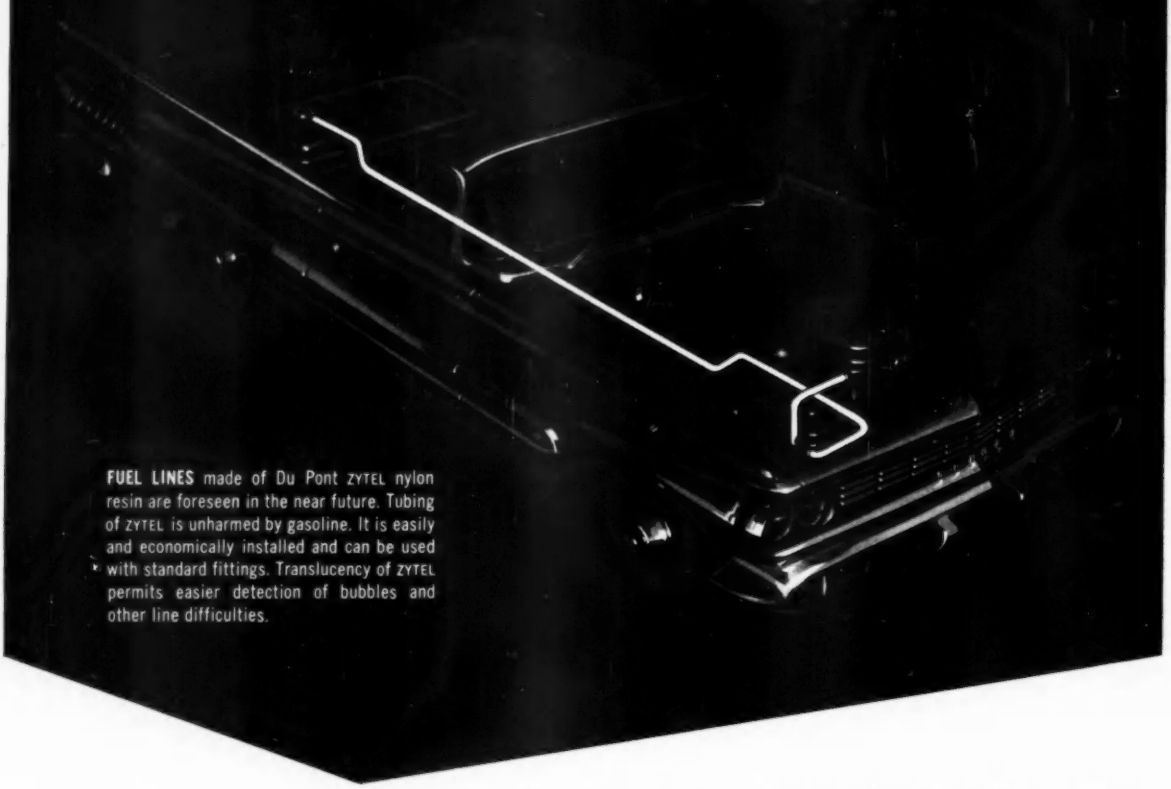
Write today for your copy of Texaco's helpful new booklet "Cleartex in Automatic Screw Machines"...and contact your local Texaco Lubrication Engineer for an authoritative survey of your automatics. Just call the nearest of the more than 2,000 Texaco Distributing Plants, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y. Dept. AI-20.

TUNE IN... Metropolitan Opera Radio Broadcasts Every Saturday Afternoon

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

Redesign for durability at low cost with flexible tubing of ZYTEL®



FUEL LINES made of Du Pont ZYTEL nylon resin are foreseen in the near future. Tubing of ZYTEL is unharmed by gasoline. It is easily and economically installed and can be used with standard fittings. Translucency of ZYTEL permits easier detection of bubbles and other line difficulties.

Tubing of ZYTEL gives you many advantages. It is exceptionally durable . . . can withstand momentary high burst pressures above 6,500 psi hoop stress. Its resilience permits recovery from crushing blows. Resistance to cold, heat and automotive chemicals is excellent. The tubing has exceptional flex life and resistance to fatigue.

You can achieve important production economies, too. Lines of ZYTEL can be installed simply by cutting to size and connecting to standard fittings. The tubing can take a cold flare. Costly prebending, deburring and elaborate installation devices are eliminated. Tubing may be color coded to ease installation and servicing.

Keep up to date on the design possibilities of ZYTEL. Send for our new brochure "ZYTEL in Automotive Applications." Have your name placed on the mailing list for "Autoplastic News," our Detroit-issued newsletter. Write for our helpful new manual "Designing with ZYTEL Nylon Resin." The address: E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department, Room Z-5-Z-1, Du Pont Bldg., Wilmington 98, Del.

In Canada: Du Pont of Canada Limited, P. O. Box 660, Montreal, Quebec

ZYTEL® NYLON RESINS

DU PONT REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

Circle 137 on Inquiry Card, for more Data

FARM EQUIPMENT INDUSTRY

(*Continued from page* 43)

are attached and detached in this way in the 1959 models. Hydraulic controls raise and lower the header. Sealed beam headlights, V-belt or chain drive for the threshing cylinders, 12-v ignition system, full-flow oil filter system, and adjustable header auger are available on the new A and R models.

A new parallel bar rake, No. 77, is now in production at Allis-Chalmers' LaPorte, Ind., works. It features a snap-coupler hitch, V-belt drive, coordinated ground and reel speed, and five-bar reel. A double-arch steel channel frame gives the rake rigidity. Roller or ball bearings are used in hubs and reel ends.

John Deere has three new models, Nos. 10, 20, and 30, in its sprayer line. The first two are three-point hitch machines, and the third is a pull-type sprayer that can be used with practically any size or type of tractor. All can be equipped with extra or optional equipment for broadjet spryaing, or with six- or eight-row booms. Row-crop drops can be added to the booms.

A new attachment to clear stones from crop land, designed for the John Deere 31 two-row double level-bed potato digger, consists of a power-driven cross-elevator at the rear of the digger to carry stones up and into a truck driven alongside. A four-plow tractor is the power unit. The digger operates about 6 in. deep, and can handle stones up to 8 in. diam.

Minneapolis-Moline Co. has announced a new self-propelled combine, designated Customatic 570, which will cut, thresh, and clean 70 acres of grain per day while traveling at 5 mph. The engine is a 6-cylinder Continental, developing 67 hp at 2200 rpm governed speed, mounted over the front axle for best traction and balance. A 12-ft or 14-ft cutter bar can be supplied, with quick-detachable header. Low profile, with overall height of 9 ft, 6¾ in., permits the combine to clear machine shed doorways, or, loaded on a truck, to get under a 14-ft highway underpass.

Wheel tread narrows to 93¾ in. for truck transportation, and widens to 106 in. for stability while in operation. Width adjustments for row-crop work are power-controlled. Hydraulic steering, ground-speed control, and raising or lowering of the header are accomplished by the M-M hydraulic system. Drives are completely shielded. Clearance between the cylinder and the concave is lever-adjusted for threshing under varying conditions. The high-speed auger folds back to fit along the left side of the machine, and can empty the 50-bushel square grain tank in 50 sec.

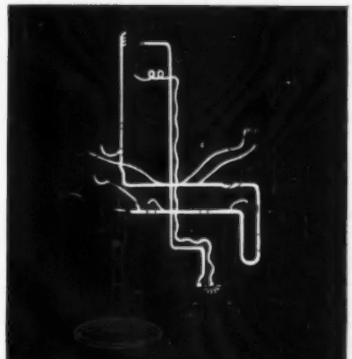
Design of the combine is such that the operator can see the cutter bar, header, wheels, and grain tank from his platform. One-shot lubrication permits the operator to lubricate 36 bearings by one push of a button on the instrument panel. The automotive-type clutch and transmission provides four forward speeds and one reverse, with variable sheaves to permit a wide range of ground speeds.

Oliver Corp. has introduced two new high-speed, two-row planters having features of special interest to small-acreage and part-time farmers. Model 312 is a three-point hitch planter, while Model 112 is a short-coupled pull-type unit for use with any tractor. Both may be operated at speeds up to 6 mph, have seed planting rates of nine instead of six, and many seed plate sizes. They are adaptable to row spacing of 30 to 42 in.

No. 152 full floating surface runner and No. 162 full floating loose ground lister are other new Oliver machines, attachable by double-hinged coupling to any 2- to 2¼-in. tool bar for seeding on all types of terrain. ■

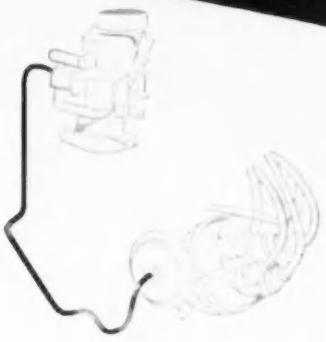
Sheraton Hotel Chain In Automotive Centers

Automotive and aircraft industrial centers have been given major consideration in recent years for the selection of Sheraton hotel locations. Sheraton now has hotels in 17 such centers of the 32 cities where Sheraton hotels are operated in this country. Included are Detroit, Los Angeles, St. Louis, Baltimore, Philadelphia, Dallas, Indianapolis and 10 other automotive centers. ■



PUSH-BUTTON LUBRICATION is made possible by rugged, flexible tubing of ZYTEL. At a touch of the control button on the dashboard, grease is pumped through ⅛" O. D. lines to the bearings. Injection pressure at the bearing ports is about 2000 psi. ZYTEL nylon resin is impervious to oil, grease and gasoline.

AIR SUSPENSION SYSTEMS depend on extruded tubing of Du Pont ZYTEL 42 and 101. The tubing needs no pre-bending . . . is tough and resistant to abrasion. It can be used with standard fittings and operates over a wide temperature range (−40 to +250°F.). ZYTEL can take punishing conditions close to the road.



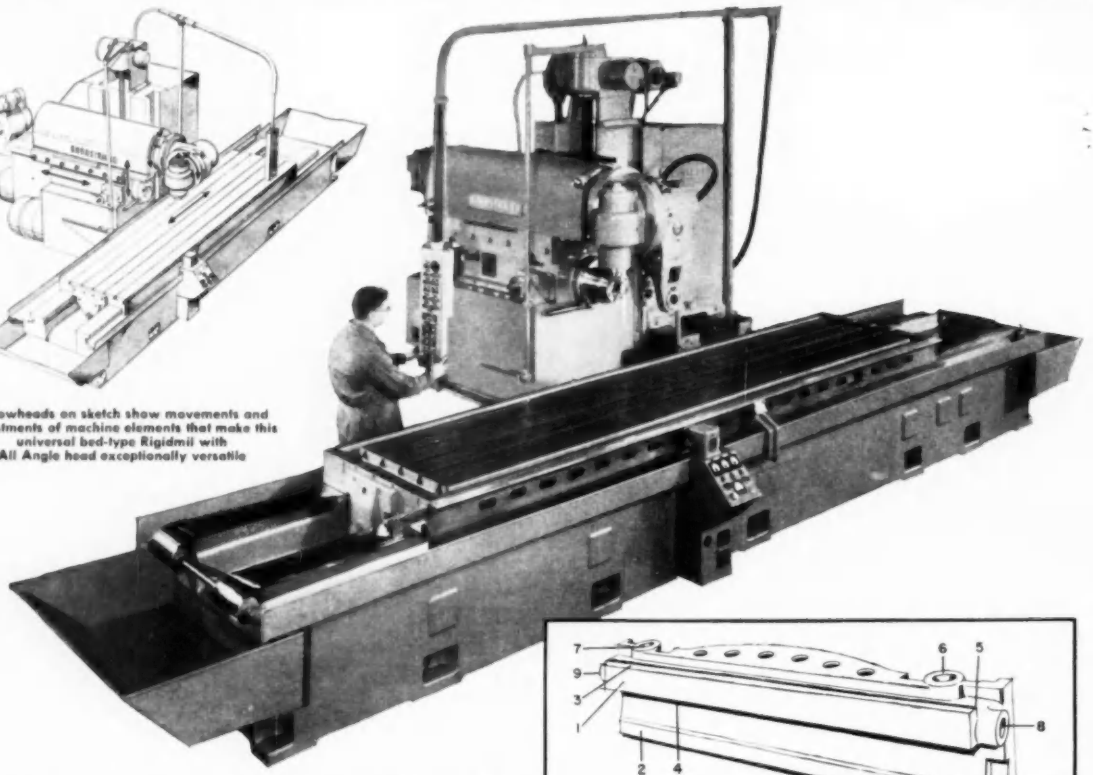
VACUUM SPARK LINE made of ZYTEL 103 adjusts spark advance to the vacuum present in the intake manifold. Operating between the carburetor and distributor, the tubing of ZYTEL resists the high temperatures beneath the hood and is unaffected by gasoline. The line is also economical to install.

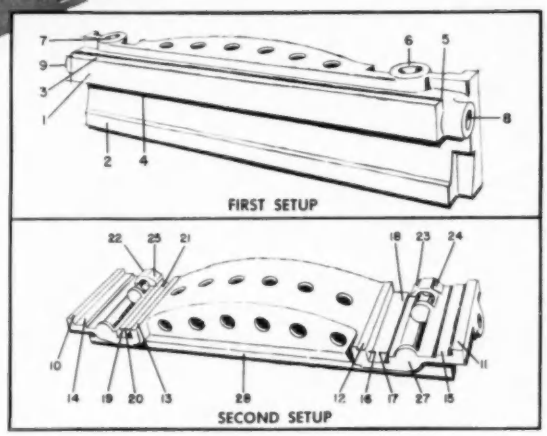
ZYTEL®
NYLON RESINS
DU PONT
REG U.S. PAT OFF.
Better Things for Better Living . . . through Chemistry

Circle 137 on Inquiry Card, for more Data

SUNDSTRAND 50-hp machines 28

Arrowheads on sketch show movements and adjustments of machine elements that make this universal bed-type Rigidmil with All Angle head exceptionally versatile





● Do you need a machine that has rigidity and power for a wide range of cuts and adds versatility to reduce parts handling and the need for expensive, special fixturing? If you do, then the universal bed-type Rigidmil with All Angle head was practically designed for you. The 28 surfaces machined in the two setups shown are typical of the range of operations readily handled on this machine.

Both the horizontal spindle head and the All Angle ram type head have the horsepower needed to handle sizable cuts. Horizontal spindle provides 50-hp maximum, and the All Angle head 20-hp maximum.

Up to 216 inches table feed stroke . . . ⅜ to 220 inches per minute longitudinal table feed . . . ⅜ to 100 ipm transverse column feed . . . ⅜ to 50 ipm head feed . . . pushbutton control of machine speeds and movements . . . these are some of the features that indicate the machine's ability to handle a broad range of work. Slab milling can also be performed using the main spindle and mounting an arbor support on the dovetail ways provided in the machine's design.

AUTOMATIC LATHES | RIGIDMILS | SPECIAL MACHINES | DRILLING MACHINES | GRINDERS

SUNDSTRAND

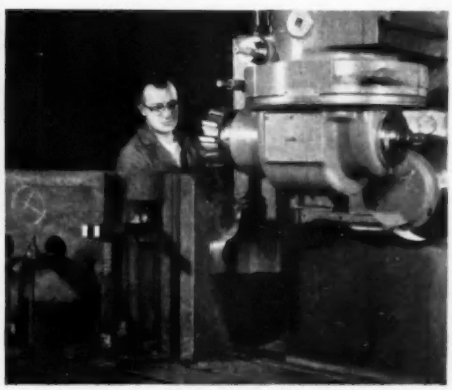
RIGIDMIL
surfaces in just 2 setups

Positioning cutter instead of work reduces setup time

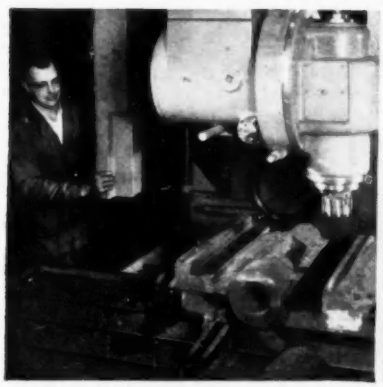
HERE'S HOW TO CUT SETUP TIME . . . Sizable cuts are taken with both the All Angle head and the main horizontal spindle so that production rate stays high despite the unparalleled flexibility. Carbide cutters are used to full advantage on both spindles as shown in typical operations below. Accuracy invariably exceeds that possible on conventional machines because of reduced parts handling. Surfaces 1 to 9 machined in first setup. Surfaces 10 to 28 machined in second setup.

HORIZONTAL SPINDLE and longitudinal table feed are used for face milling first surfaces of large casting.

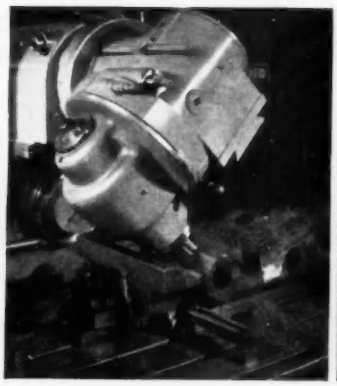
MACHINING ON TOP of the work is illustrated in this example using the All Angle head and longitudinal table feed.



ANOTHER EXAMPLE of the ease with which it is possible to move the cutter instead of workpiece is on this step using All Angle head and vertical feed.



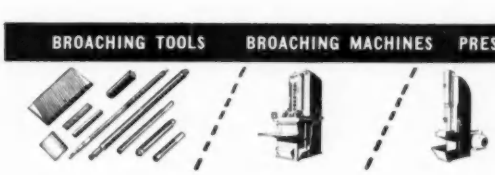
ANOTHER POSSIBLE combination of machine movements is shown here where All Angle head in vertical position is coupled with transverse feed.



ALL ANGLE HEAD is used to mill clearance cuts at an angle using transverse feed. All power feeds are infinitely variable.

HORIZONTAL SPINDLE returns to action in combination with longitudinal table feed. Power operated drawrod (extra) for horizontal spindle makes cutter changing easier.

ADDITIONAL DATA describing the universal bed-type Rigidmil with All Angle head is available in Bulletin 699. Write for your copy today!



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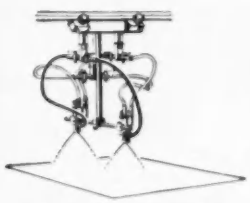

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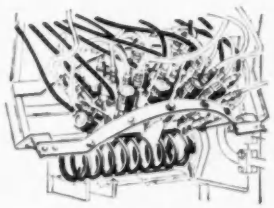

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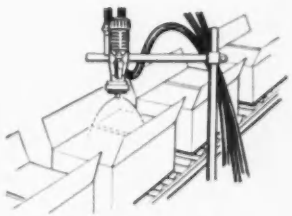
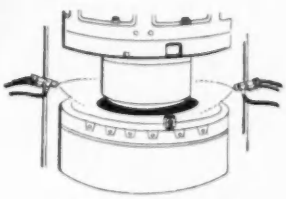


APPLYING ADHESIVES



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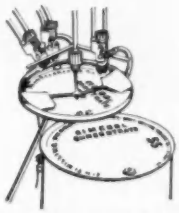

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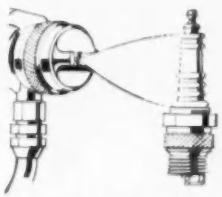

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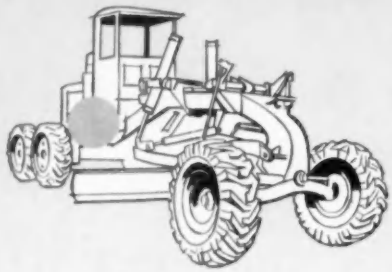
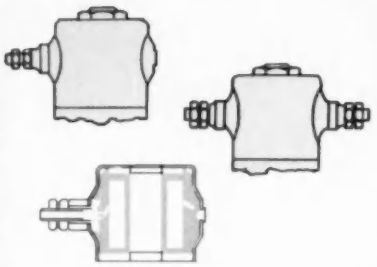
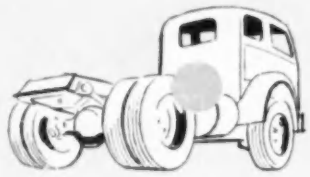


Automatic diesel governor control. To improve brake life and save fuel this motor grader uses a Skinner V5, three-way, normally open solenoid valve to relieve pressure in the hydraulic actuated engine governor. When the brakes are applied, the valve is energized by a pressure switch on the master cylinder causing the valve to close and bypass oil from the governor cylinder which reduces the pressure and throttles the engine.

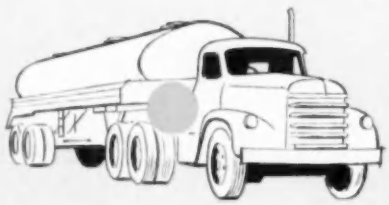


Skinner solenoid valves are available with single or double automotive terminals; specially designed automotive housings with potted coils (coil, housing leads and flux plate are potted with a compound to make them vibration-proof and moisture resistant); and waterproof molded coils that operate in all types of weather, under the severest conditions—even under water.



Saddle tank operation. Energized by a standard dash-mounted toggle switch, a Skinner valve makes fuel level readings and tank switching a one-step, push-button operation. Valve reduces accident hazard by preventing driver's attention from being diverted; saves on labor and materials by eliminating fuel piping.

Additional features of Skinner automotive valves include: stainless steel internal parts; soft synthetic, long-lasting inserts that provide bubbletight sealing; spring-loaded plungers; mounting in any position; orifice seats with radius with well-rounded contact area and high finish for long insert life. All valves are built to the highest UL standards for the convenience and safety of the automotive industry.



Propane and butane fuel cut-off. On trucks using liquid propane or butane fuel, Skinner V61 solenoid valves are used as a safety device to automatically shut off the tanks from the fuel system when the vehicle is not in operation. The valve is installed on the line ahead of the vaporizing unit and is energized by the ignition switch. Skinner valves for this application are approved by the Underwriters' Laboratories.

Skinner solenoid valves help solve automotive problems like these

SKINNER SOLENOID VALVES ARE DISTRIBUTED NATIONALLY. For complete information, contact a Skinner Representative listed in the Yellow Pages or write us at Dept. 332.

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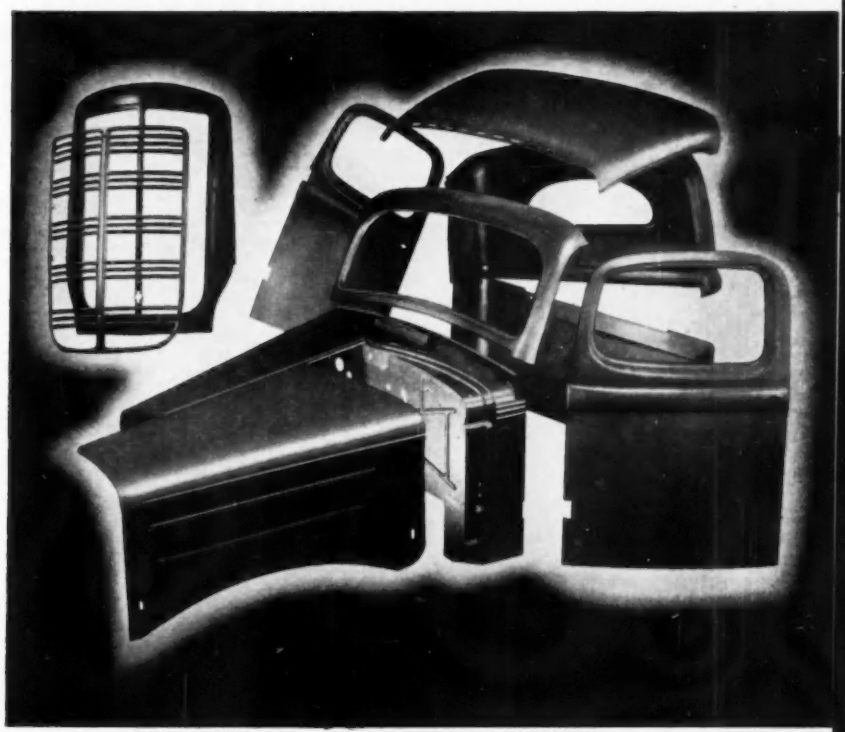
Wherever steel becomes a part of things *you* make, the high standards of Youngstown *quality*, the personal touch in Youngstown *service* will help you create products with an "accent on excellence".



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BUFFALO 7, N. Y.

THE
YOUNGSTOWN
SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel, Youngstown, Ohio

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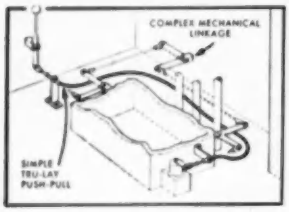
TRU-LAY PUSH-PULL DATA FILE SHOWS HOW TO SIMPLIFY AND IMPROVE DESIGN



Push-Pull remote controls, shown here, are flexible, have but one moving part, and give a lifetime of accuracy. Mechanical linkages are complex, are made of many parts, wear at many points, and produce increased backlash, lost accuracy, and vibration rattles.

This Push-Pull Data File—containing 7 engineering bulletins—will show you how these flexible controls have eliminated mechanical linkages on hundreds of products. You can make *your* products more useful, easier to sell, with Push-Pull controls. Write for your Data File today.

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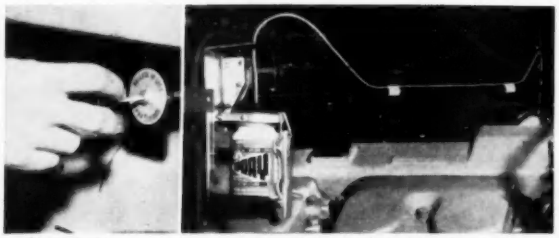

*Patent Pending

▲A cover, not shown, protects the mechanism.

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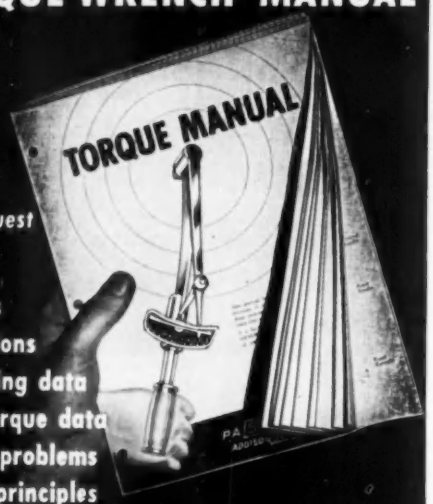

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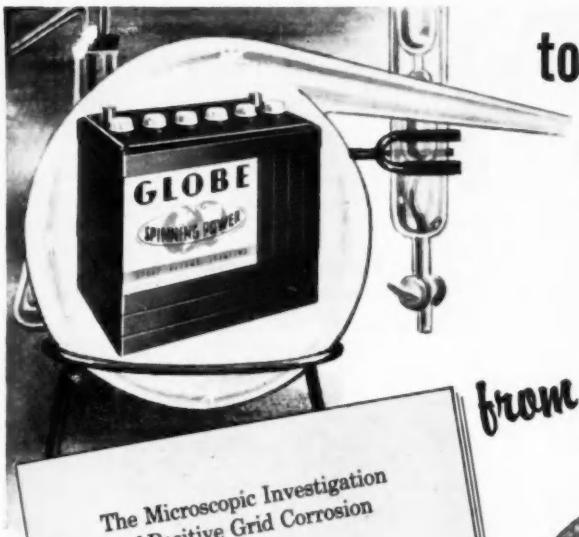

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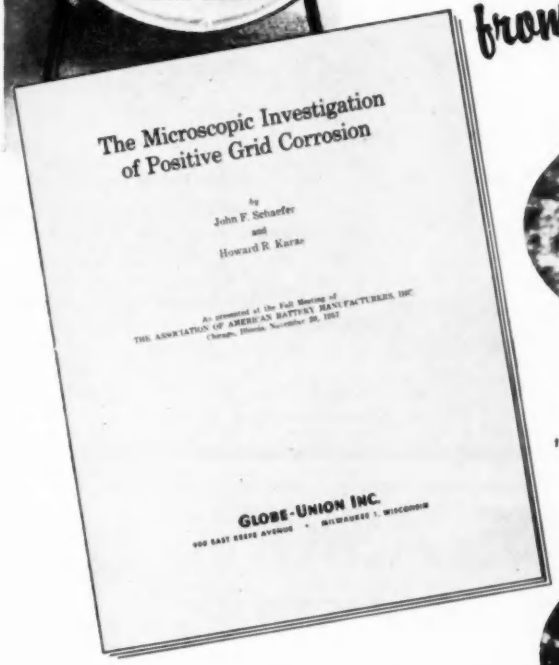
from GLOBE RESEARCH THIS SIGNIFICANT GRID CORROSION STUDY



The Microscopic Investigation of Positive Grid Corrosion

by
John F. Schaefer
and
Howard R. Karas

As presented at the Fall Meeting of
THE ASSOCIATION OF AMERICAN BATTERY MANUFACTURERS, INC.
Chicago, Illinois, November 20, 1957

GLOBE-UNION INC.
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Corrosion standing* . . . cross-section of a grid bar from a battery which stood two years without attention in an unheated garage shows typical corrosion pattern.

Corrosion in service* . . . grid section from a battery after two years of actual service. 21,000 miles of driving shows 20% corroded.

Corrosion—standard cell* . . . grid section from standard cell of battery in 1000-mile-per-day Test Fleet service, shows 28% grid metal loss after 191,500 miles service.

**Microscopic pictures of grid sections 100-magnification.*

Globe-Union Research engineers and chemists regard every new battery as a challenge — are determined to find flaws even in their own Globe products. For from such impartial and exhaustive analyses have come the continuous improvements in Globe batteries for over 25 years . . . spurring battery developments throughout the entire field.

One example of important Globe research is the study offered here: a very thorough 20-year examination of the corrosion of positive grids — a major cause of service failure of lead-acid storage batteries. The sampling of subjects shown suggests the range of this study. And because we believe the material, approaches and conclusions will be of special interest to you, a copy is available at no cost if you will simply fill out and mail the coupon.

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A
American Chain & Cable Co. Automotive & Aircraft Div. ... 80
B
Bendix Aviation Corp. Products Div. ... 5
Bethlehem Steel Co. ... 61
Buffalo Bolt Co. ... 70
C
Cincinnati Milling Machine Co. ... 68
Classified Advertisement ... 70
Copperweld Steel Co. Aristoloy Steel Div. ... 16
Ohio Seamless Tube Div. ... 65
Cotta Transmission Co. ... 1
D
Dana Corp. (Spicer) ... 50
De Vilbiss Co. ... 76-77
du Pont de Nemours & Co., E. I. Polychemicals Dept. ... 72-73
E
Eaton Mfg. Co. Valve Div ... 55
F
Fram Corp. ... 67
G
Garlock Packing Co. ... 51
Garrett Corp. AiResearch Industrial Div. ... 6
Gillett & Eaton, Inc. ... 63
Globe-Union, Inc. ... 81
Goodrich Chemical Co., B. F. ... 15
I
Inland Steel Co ... 53
International Nickel Co., Inc. ... 2
K
K-D Lamp Co. ... 13
L
Lansing Stamping Co. ... 80
Lindberg Engineering Co. Lindberg-Fisher Div. ... 10-11
M
Mechanics Universal Joint Div. ... 14
Moraine Products Div. ... 59
O
Ohio Seamless Tube Div. Copperweld Steel Co. ... 65
Ortman-Miller Machine Co. ... 70
P
Perfect Circle Corp. ... 47
R
Ransburg Electro-Coating Corp. ... 8
Rockwell-Standard Corp. Transmission & Axle Div. ... 7
Roebling's Sons Corp., John A. ... 49
S
Sheffield Corp. ... 9
Shuler Axle Co., Inc. ... Back Cover
Skinner Electric Valve Div. ... 78
Southern Screw Co. ... 69
Spray Products Corp. ... 80
Standard Oil Co. (Indiana) ... 2nd Cover
Sturtevant Co., P. A. ... 80
Sundstrand Machine Tool Co. ... 74-75
T
Texas Company ... 71
Tulsa Winch Div. ... 64
U
Udylite Corp. ... 3rd Cover
W
Weirton Steel Co. ... 57
Wyman-Gordon Co. ... 12
Y
Young Radiator Co. ... 66
Youngstown Sheet & Tube Co. ... 79

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covering the issues from July 1 to December 15, 1958, inclusive

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FREE LITERATURE

Silicone Information 1

Dow Corning Corp. has prepared Folder 1-131 to meet the informational needs of designers. The book covers the use of silicones to aid miniaturization and weight reduction, and helps to increase the reliability of missile and missile components.

Storage Batteries 2

Form 6230 covers a line of storage batteries which has application in electric industrial trucks. *Exide Industrial Div., The Electric Storage Battery Co.*

Needle Thrust Bearings 3

Catalog 759 covering needle thrust bearings with increased capacity ratings is offered by The Torrington Co. It discusses installation, lubrication, and load capacity of the bearings; also design and installation of the Thrust Races for use with these bearings.

Fastener Data 4

Form 2449, eight pages, describes a complete line of standard precision industrial fasteners—including socket screw products, pressure plugs, locknuts, spring pins, dowel pins and steel collars. *Standard Pressed Steel Co.*

Dew Point Equipment 5

Autocarb systems for control of carbon potential and their applications are described in a six page Bulletin SC-181. *Surface Combustion Corp.*

Forging Facilities 6

The Park Drop Forge Co. has published a 24 page brochure covering all phases of its forging facilities and range of products.

Center Bonded Mountings 7

Bulletin 712, four pages, describes the vibration isolated and heavy shock absorption features of center bonded mountings. *Lord Mfg. Co.*

Phenolic Products 8

An eight page booklet CDC-358 describes a complete line of Phenolic resins, varnishes and molding powders. *Chemical Materials Dept., General Electric Co.*

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21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220
221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260
261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	**280**
281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300

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Free INFORMATION SERVICE

FREE LITERATURE—*Continued*

Hydraulic Cylinders 9

A catalog sheet containing data on "Aids for Preventing Excessive Bearing Wear and Column Failures" is available from the Miller Fluid Power Div., Flick-Reedy Corp. The sheet provides the answers to problems relating to the column strength of hydraulic cylinder piston rods.

Cutting Fluid 10

A new solution type cutting fluid, especially designed to replace cutting oils on heavy duty operations, is described in a 12 page brochure entitled "Cimcool Cimperial" (PC-359). The brochure explains the features of this chemical solution and contains a chart of recommended dilutions. *The Cincinnati Milling Machine Co.*

Tool Steel Brochure 11

Twelve page Bulletin, TS-101, describing "LO-AIR" tool steel, has been published by Universal-Cyclops Steel Corp. It contains technical data on machining, heat treatment, mechanical fatigue properties of the new tool steel.

Adhesives Data 12

A 12 page illustrated catalog describing design concepts, typical applications, and general characteristics of adhesives, coatings, and sealers is available from the *Adhesives, Coatings & Sealers Div., Minnesota Mining & Mfg. Co.*

Straddle Carrier 13

A four page brochure describing the M300E straddle truck carrier has been published by the *Hyster Co.*

Power Application 14

Detailed information on the Towmastatic Drive, a method of power application for fork lift trucks—based on the principles of hydrostatics—is available in a 12 page Booklet SP-24. *Towmotor Corp.*

Polishing, Buffing Units 15

Wilson Buffing Chuck & Machine Co. has prepared a six page catalog illustrating that automation is now possible in the field of polishing and buffing. Shown are models for continuous straight line, rotary or reciprocating action.

Milling Machine 16

Bulletin 675-A, 32 pages, describes a line of special milling machines. Types included are straight-line, vertical openside, sliding head, shuttle type, rise and fall, rotary index, traverse, planer and traveling column. *Consolidated Machine Tool Div., Farrel-Birmingham Co., Inc.*

D-C Power Supplies 17

A four page folder covering the uses and specifications of Electro Model PS-2 dual purpose d-c power supply has been announced by *Electro Products Laboratories.*

A-C Magnetic Starters 18

Publication EN-150, 15 pages, describes a line of a-c magnetic starters. The line includes starters in NEMA sizes 0 through 4 for both reversing and non-reversing single phase and squirrel cage motors. *Cutler-Hammer Inc.*

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FREE LITERATURE— *continued*

Venturi Torch Burner 19

Data Sheet 1A-9 contains complete engineering specifications on the Bryant HI-LO venturi torch burner. The burner offers 10 to 1 turndown with low-pressure gas—with single-valve control and without a costly air blower or a complex control system. *Bryant Industrial Products Corp.*

Hand Trucks 20

Complete specifications and a full description of operating characteristics of four high-lift, battery powered hand trucks are contained in a six page brochure. *Clark Equipment Co.*

Paint Test Panels 21

Form A7310, four pages, describes an automated production line for producing paint test panels which are available to industry. *Parker Rust Proof Co.*

Insert and Power Bits 22

Catalog 12-C describes a double forging process used in making Phillips and Frearson type insert and power bits and lists point and shank dimensions for 148 standard stock bits. Eight pages. *Zephyr Mfg. Co., Inc., Accessories Div.*

Resistance Welding 23

Twenty eight page Bulletin "FEDERAL PP-54" illustrates and describes resistance welding in all phases, spot welding, projection welding, seam welding, flash welding, etc. *The Federal Machine & Welder Co.*

Data Processing 24

Publication of a brochure describing the functions of Univac data processing equipment has been announced by the Remington Rand Div. of Sperry Rand Corp. It illustrates a broad range of basic data processing functions and shows the specific equipment to execute them.

(Please turn page)

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Cold Saw Machines 25

Bulletin 537-A, 12 pages, describes and illustrates Newton cold saw machines for cutting ferrous and nonferrous material. Machine sizes, given in saw-blade diameters, range from 32 to 120 in. *Consolidated Machine Tool Div., Farrel-Birmingham Co., Inc.*

Magnetic Drill Stands 26

Bulletin 10406, four pages, on the use and applications of a line of magnetic drill stands is available from *Thor Power Tool Co.*

Flexible Couplings 27

Bulletin 205 contains detailed specifications for three standard shear-type flexible couplings, 1/50 to 100 hp at 1750 rpm. *Lord Mfg. Co.*

Spray Painting 28

Powerflo Catalog "Section A" features a line of spray painting equipment for contract, production, and maintenance painting. *Gray Co., Inc.*

Control Valves 29

An eight page bulletin illustrates and gives specifications on Beckett "Hi-Cyclic" air and hydraulic control valves. *The Beckett-Harcum Co.*

AI Index 30, 31

Check 30 on postcard for index to Vol. 119 (July 1 to Dec. 15, 1958) of AUTOMOTIVE INDUSTRIES. A limited number of copies of the index to Vol. 118 (Jan. 1 to June 15, 1958) are also available. Check 31 if you wish this index also.

Stainless Steel Bars

"The Machining of Stainless Steel Bars, Section Two" is the title of an eight page data sheet prepared by the Allegheny Ludlum Steel Corp. Topics covered include tooling for milling, lubrication, and stainless steel finder notes. Address request on company letterhead to the *Allegheny Ludlum Steel Corp., Publications Dept., Henry W. Oliver Bldg., Pittsburgh 22, Pa.*

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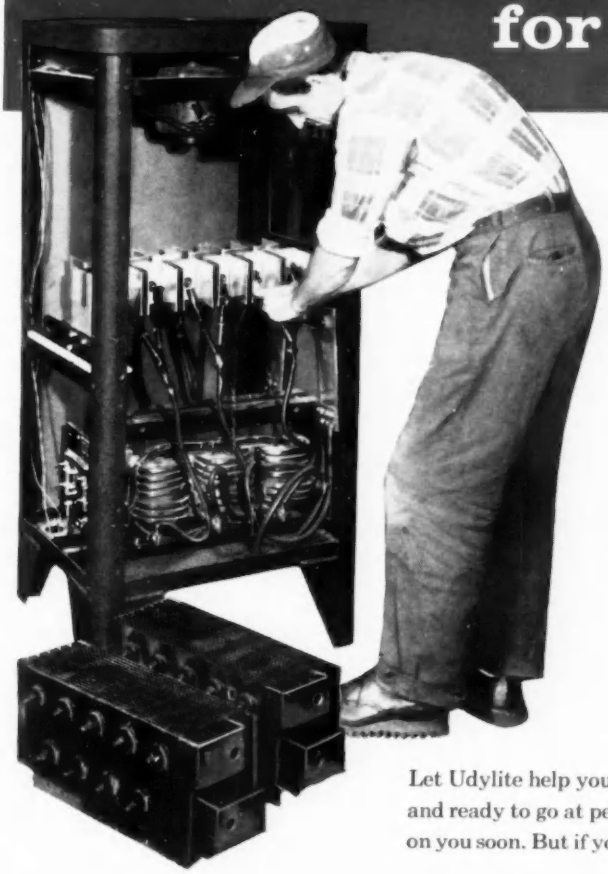

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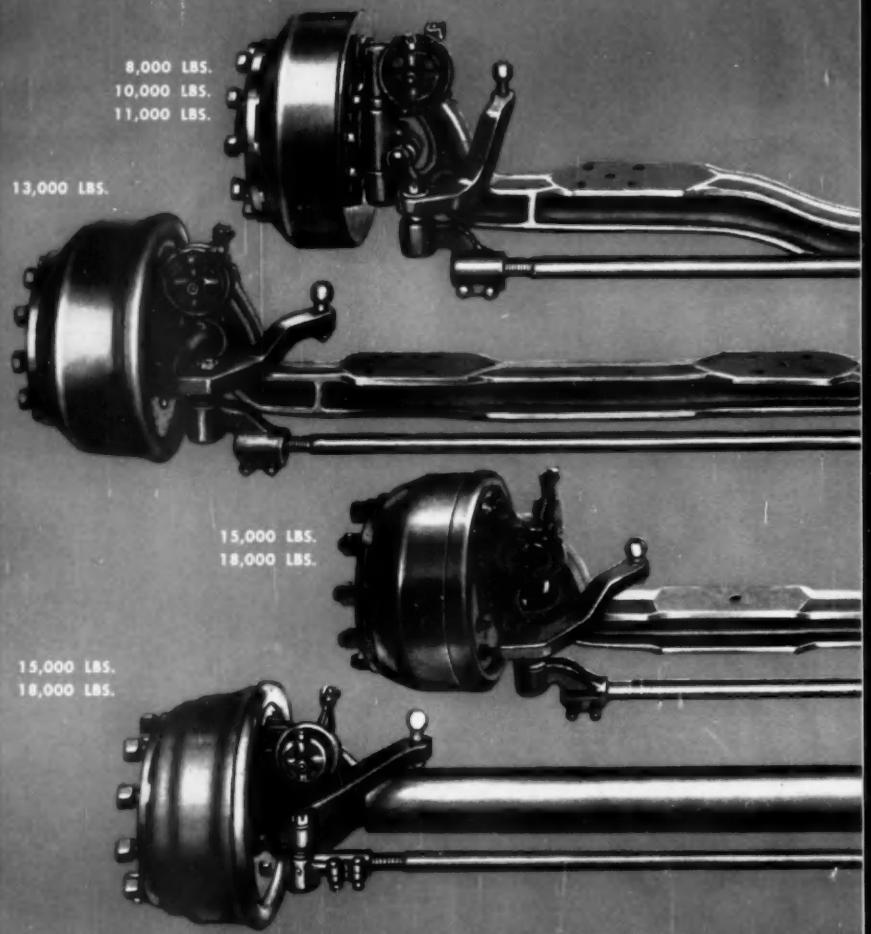

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